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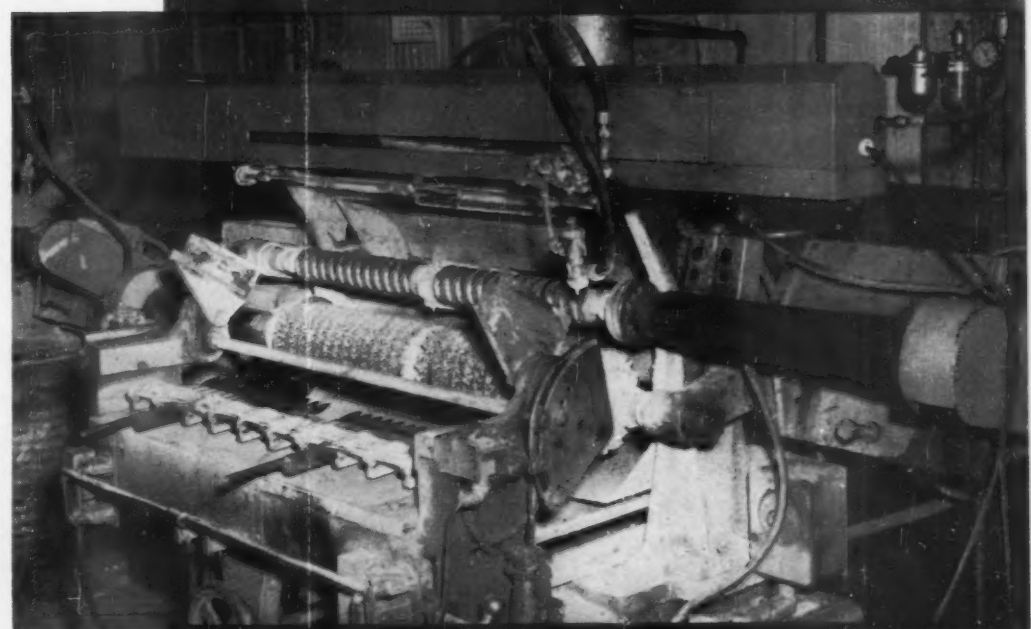
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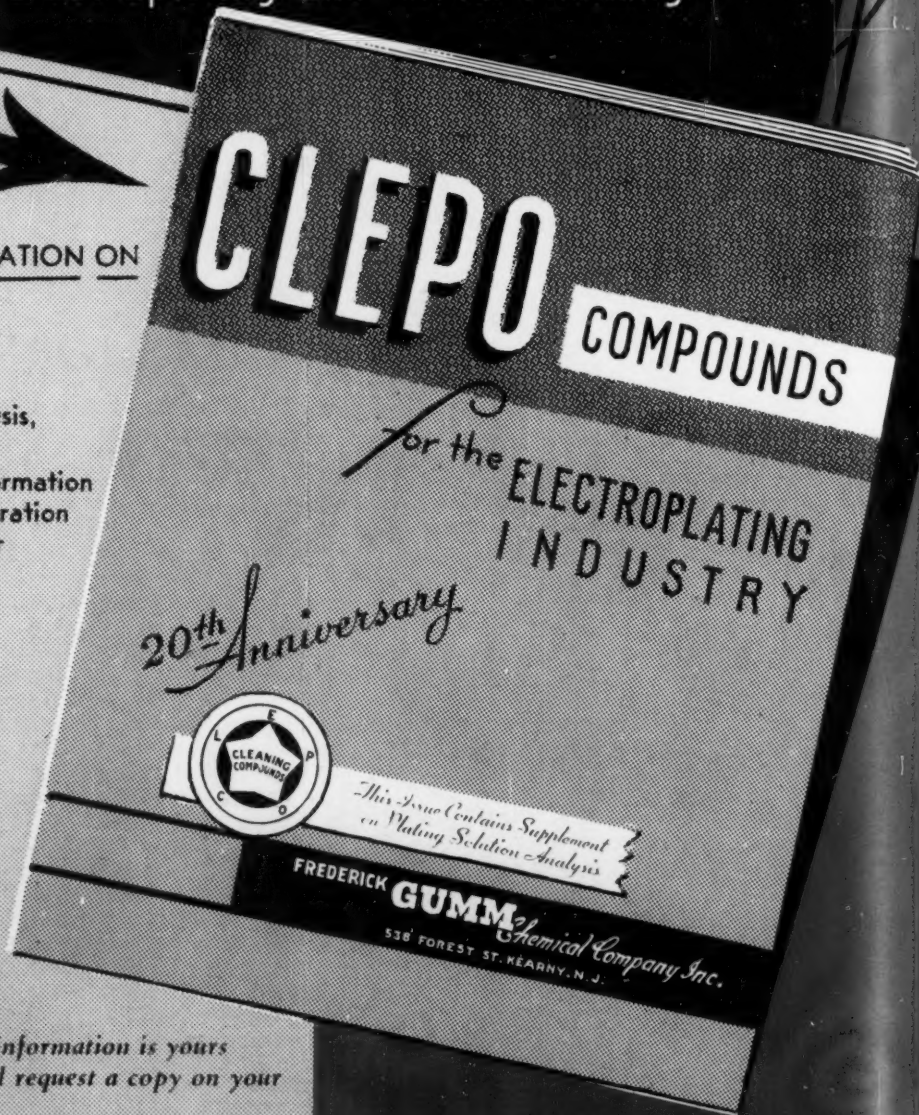
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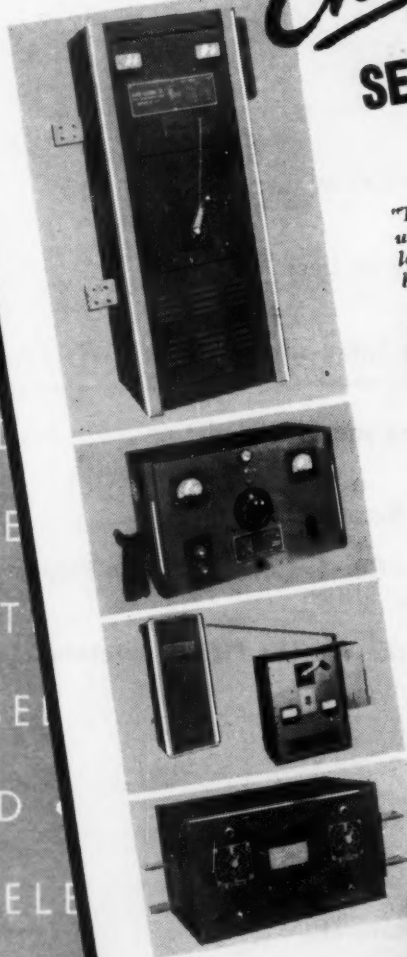
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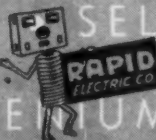
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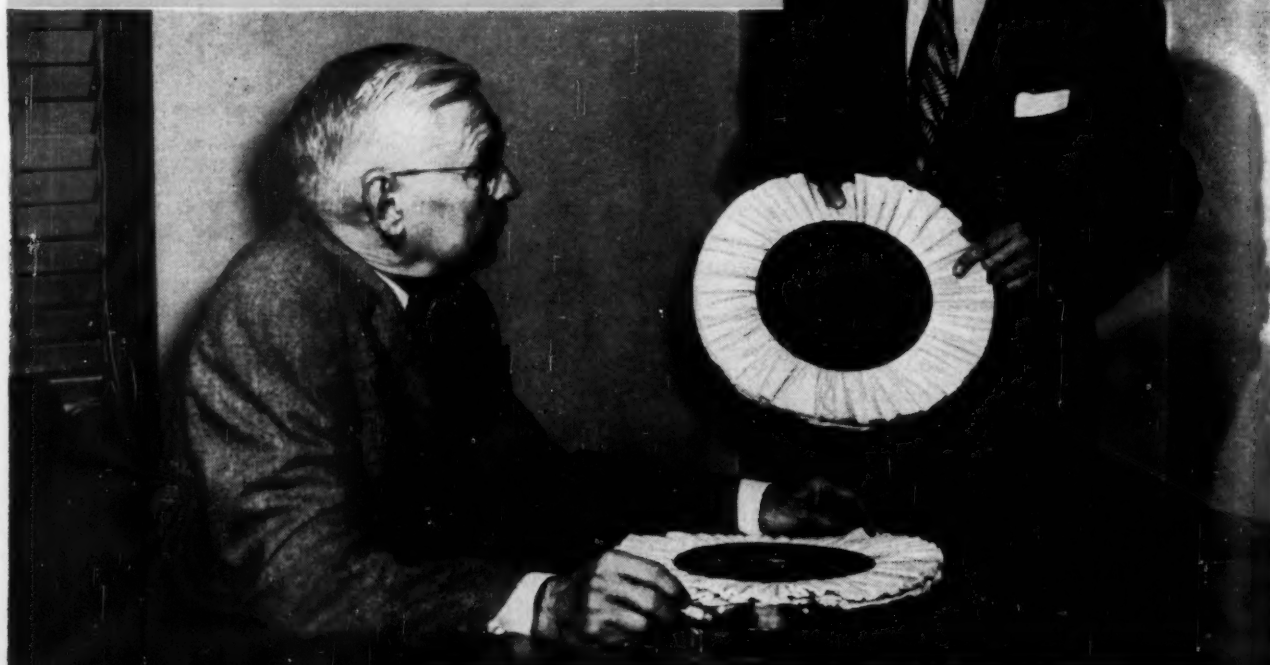
Charles A. Cerami

OBSERVER

News and Views from The Nation's Capital

- . Machinery manufacturers have the option of figuring increased costs of conversion steel on a monthly, bi-monthly or quarterly basis, per amendment 42 to CFR-30. These same manufacturers also benefit from the broadening of Supplementary Regulation No. 8 to allow Capehart pricing for standard types of machinery where pricing is done by formula.
- . Signs of the times? Wage Stabilization Board and Salary Stabilization Board are closing their information offices in Providence; Syracuse; Charleston, W. Va.; Charlotte, N.C.; Columbia, S.C.; Savannah; Omaha; Des Moines; Oklahoma City; Little Rock and Phoenix.
- . Makers of TV and automobile radio antennas will start getting more controlled materials, according to NPA.
- . Also from NPA comes an amendment to M-8, making many changes in tin uses permitted, including: tin oxide quota for colors in Schedule VI raised from 60% to 80% of base period; tin used as additive in zinc galvanizing moved from Schedule VIII to Schedule VII. The NPAF-7 form for tin reports has been revised.
- . The national cost of living index was down by .6 for December, mainly because of a food price fall, but on a city-by-city basis, there is no appreciable trend up or down.
- . Wholesalers and retailers pricing new articles under Section 5 must use as their comparison article one which is purchased from a supplier of the same class, under recent Amendment 39 to the GCPR. The previously permitted use of an article bought from a supplier of a different class resulted in distorted mark-ups.
- . Metal fabricating and assembling firms should note revisions in Form NPAF-1. Only two copies are now required. Man hours worked need no longer be reported, but data must be filed for all subsidiary plants which fabricate or assemble metal products.
- . The first half of 1953, at least, should see economic activity on a level equal to or higher than 1952, according to almost every economic survey or report. The labor market should be tight with continued pressure for wage increases. Non-labor costs should also rise. As for the second half of the year, few will venture a prediction at this time. But considering the unrelieved gravity of the international situation and the need for an unabated defense program, it is hard to see how any sustained or important decline can be in the cards.
- . Aluminum foil and powder inventories still must not exceed a 60-day supply or minimum operating level, whichever is less.
- . OPS has allowed a 3½ cent per pound increase on primary nickel. This is to balance the rise in cost of Canadian nickel. No blanket pass-through has been provided for users, though this may come within the next 30 days.
- . Salary Stabilization Board announces some of the ground on which applications for increases may be submitted and stand a good chance for favorable consideration. One interesting point is that increases made because of substantial growth in business since 1950 have a place on this list. Also included are new expense accounts for salesmen and others who previously had no such privilege.

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THE MATERIALS OUTLOOK

The outlook for 1953, barring an unforeseen reversal in anticipated Government policies, appears very favorable except in the case of nickel. A record aluminum output of 2.5 billion pounds has been forecast for this year, which is expected to jump to 3.0 billion pounds in 1954. This will mean plenty of the metal for all within the next few months. The rise in production, coupled with the new "stretch-out" of defense goals, which calls for cutbacks in tank and military truck production, heralds the end of steel shortages. Copper is the only one of the important base metals which will probably be tight throughout the year, but will not be sufficiently so to result in any hardship for the plater, although the fabricator will have to skimp. Comprehensive action by the Government with respect to stockpiling and price control would result in a general loosening up, however.

Lead, zinc, tin and cadmium are in very good supply compared with last year; in fact a drop in the price of the last two would come as no surprise. And finishing chemicals are, at present, offering no important problems of supply, in general. Even nickel salts, produced almost exclusively from secondary metal, can be obtained without resorting to the black market. Not only has the availability of nickel salts from foreign sources improved but the quality is more in line with plating requirements. Although the price is about 10 cents a pound above that of domestic salts, it serves to ease what would otherwise be a critical shortage, especially since it is not subject to allocation controls.

The estimated primary nickel available to the free nations for the first quarter, however, is only 0.6 percent higher than for the previous quarter. This falls considerably short of requirements, so that the need for strict economy continues to exist. An impression, which seems to have received wide acceptance, is that our nation, although the "arsenal of democracy," is being discriminated against in the allocation of nickel. A glance at the recommended distribution of the International Materials Conference shows how nonsensical this impression really is. The United States, which accounts for practically no production, has been allocated more than twice as much primary nickel as *all* the rest of the free world combined. Canada, on the other hand, which produced about 90 percent of the total, was allocated less than 2½ percent.

Unless the Korean affair takes a turn for the worse, this industry can expect to function fairly normally during the present year and, were it not for the unhappy nickel outlook, we could consider ourselves quite fortunate.

Nathaniel Hall

Plating Room Waste Water Disposal

By S. F. O'Connor, *Finishing Engineering Department, Indianapolis Plant, Western Electric Company, Inc.*

IN the planning for a new plant for making telephones at Indianapolis, Indiana, a major consideration was the disposal of wastes from metal finishing processes. The methods and treatment facilities used to protect the city sewage system from harmful effects of our wastes may be of interest to others faced with waste disposal problems.

Our study of the type of waste water to be treated from the plating room indicated that the plant would have to handle from 700 to 800 gallons per minute. It would be made up of 250 g.p.m. of waste water containing an average cyanide concentration of 50 to a maximum concentration of 200 parts per million which would come from the cyanide rinse tanks; 320 g.p.m. of mixed alkali and acid rinses, pH of which would vary from less than 1 to over 13; and an average of 400 gallons per day of concentrated cyanide waste containing about 8,000 parts per million cyanide radical. There would also be 100 g.p.m. of rinse waters containing hexavalent chromium.

The plant disposal line empties into a city sewer which handles approximately 13,000,000 gallons per day and empties into a sludge treatment tank that handles about 80,000,000 gallons per day. The plant waste output is diluted about thirteen to one in the trunk sewer and eighty to one in the sludge plant.

It was decided to provide methods of treatment

which would insure against waste waters entering the sewer system, which were on the acid side or that contained any cyanide radical. Three processes were provided; one for oxidizing the cyanide radical in the dilute cyanide waste water to the cyanate radical which has only one thousandth the toxicity of the cyanide radical; a second for oxidizing the cyanide radical in the concentrated cyanide wastes completely with end products of CO_2 and N_2 ; and a third for neutralizing the acid waste water. No treatment is provided for the hexavalent chromium as the amount used is so small that it can be taken care of by dilution and reaction with household sewerage.

The Treatment System

The system as installed can logically be broken down into five units as follows:

1. The storage and handling of the liquid chlorine used in the oxidation of the cyanide radical.
2. The storage and handling of the caustic soda used in the neutralization of the acid wastes and for maintaining the pH in the cyanide wastes during oxidation.
3. The dilute cyanide waste treatment system.
4. The concentrated cyanide waste treatment system.
5. The acid and alkali waste treatment system.



The chlorine used in the waste treatment system is received as a liquid in one-ton cylinders. It is planned to purchase the chlorine in carload lots of fifteen one-ton cylinders and store the cylinders on dollies. These would be stored in a cinder block shed some distance from the main building and towed by truck to the waste water disposal operating room. This room is in the main plant

Figure 1. Scales weigh chlorine drums to show how much is used. Disposal pit grating can be seen in floor between scales.

CHLORINE SYSTEM

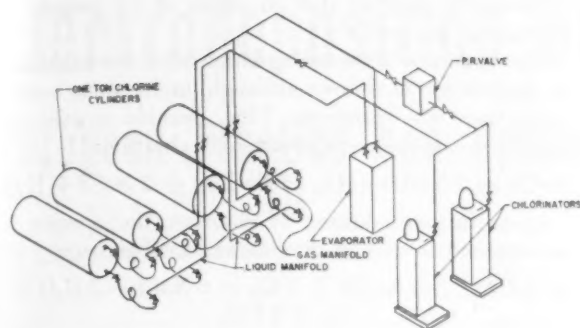


Chart A

but is sealed from the main area so that any chlorine which might be accidentally released cannot diffuse into the manufacturing area. Other precautions include an exhaust system discharging across the roadway at a considerable distance from the plant and an electrical interlock with the plant air intake fans so that these may be shut down in case of a serious leak, thus guarding against a general distribution of chlorine within the plant. Equipment is available for sealing almost any type of leak which is apt to develop in the cylinders, and all piping may be readily emptied of chlorine for repair.

Figure 1 shows one-ton cylinders of chlorine on the two scales provided to weigh the chlorine as used. The cylinders are always filled to a definite weight of chlorine, but the weights of individual cylinders vary. For this reason, it is necessary to "tare weigh" the cylinders each time a cylinder is placed on the scale so that the amount of chlorine remaining is known at all times.

Chart A shows a schematic arrangement of the chlorine system. The normal operation of the system is to connect the cylinder to be used to a manifold leading to the chlorine evaporator through the bottom valve to the cylinder. The normal pressure in the cylinder, which is about seventy-five pounds at 70°F., forces the liquid chlorine through the manifold into the evaporator.

The chlorine is evaporated by means of a water bath which is heated to about 150°F. by an electric heater. The chlorine gas is then fed through a reducing valve, which reduces its pressure to ten pounds, and from there to the chlorinator. In case the evaporator becomes inoperative, the cylinders can be con-

CAUSTIC SODA SYSTEM

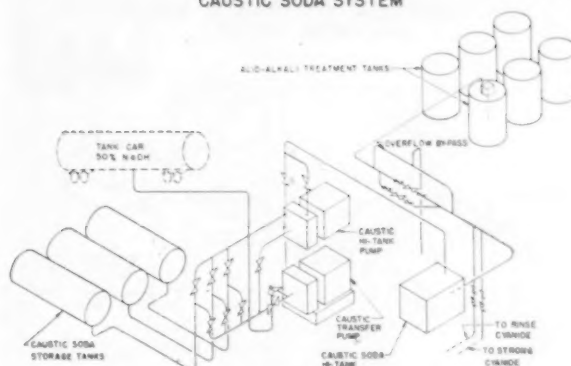


Chart B

nected in parallel and chlorine gas-bled off the top of the cylinders directly to the chlorinators in sufficient quantity to treat the cyanide rinse waters. Figure 2 shows the chlorine cylinders in the foreground, the evaporator on the left and the chlorinators. The chemical control bench is against the wall on the right.

The caustic soda handling system is shown on Chart B. Liquid caustic soda having a concentration of 50% is received in 8,000 gallon tank car lots. The solution is diluted to 20% by mixing it with about 18,400 gallons of water during the unloading. It is necessary to dilute the solution to prevent its freezing during the winter months. The 50% solution freezes at 54°F. while the 20% solution freezes at -18°F. There are three storage tanks each having a storage capacity of 15,000 gallons, so that two tanks have to be empty to unload a tank car of caustic. One storage tank full of 20% caustic will supply the system for about two weeks so that it is important to schedule the receipt of a car of caustic within this two-week period. The 20% caustic soda is pumped from the storage tanks to a constant level tank from where it is delivered by gravity to the various points of use. The 20% caustic soda is also used throughout the plating room and is deliv-

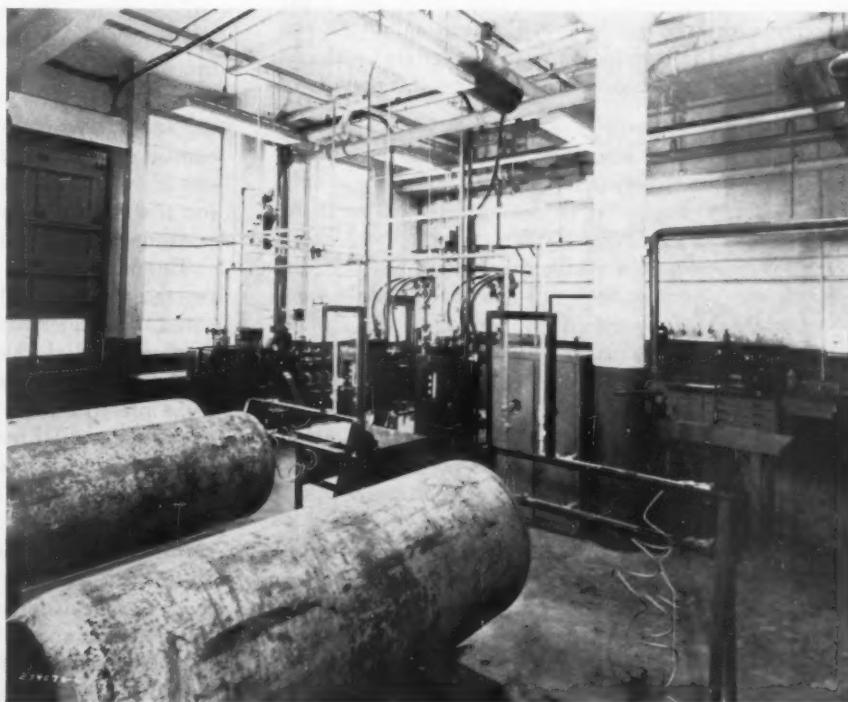


Figure 2. Evaporator (left), chlorinators, and piping. Drums in left foreground are chlorine drums of Figure 1; laboratory facilities for chemical control are in background at right.

TREATMENT OF CYANIDE WASTE RINSE WATER SYSTEM

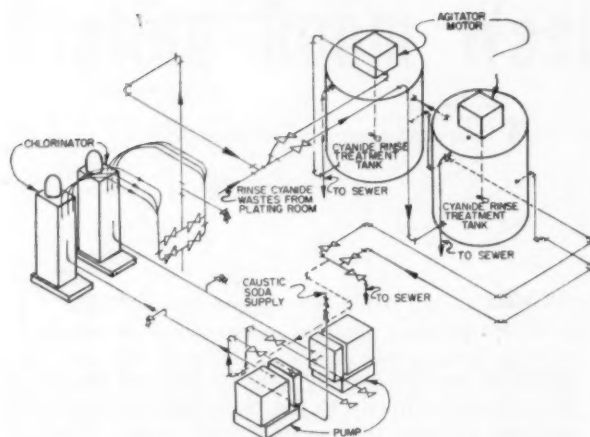


Chart C

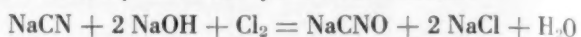
ered to the points of use through a piping system by means of a centrifugal pump and surge tank.

The dilute cyanide waste treatment system is shown on Chart C. A separate drainage system is used to collect waste from the various cyanide rinse locations in the plating room and deliver it by gravity to one of two 6,000 gallon treatment tanks. It enters the tank at the bottom and flows upward, being mixed at the same time by an agitator. It flows out of an opening at the top of the tank into the second tank, where it is further agitated, and then to the sewer. The oxidation of the cyanide radical is carried out at a pH of 8.5 or above to prevent the formation of cyanogen chloride gas which is similar to tear gas. The chlorine is added by pumping about 70 g.p.m. of waste from the first tank through the chlorinator and back into the drain line delivering the waste to the first tank. Caustic soda is added as required.

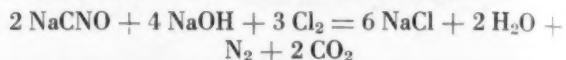
The rate of chlorination is controlled at the chlorinator and is determined by the amount of free chlorine in the first treatment tank. This check and a pH determination are made every fifteen minutes. The oxidation of the cyanide radical to cyanate is almost instantaneous and theoretically requires 2.6 pounds of

chlorine for every pound of cyanide radical oxidized. It is usually assumed that an excess of 1.5 pounds of chlorine is required.

The generally accepted equations for the oxidation of cyanide are as follows although, under some conditions, there are variations. First, cyanide is oxidized to relatively non-toxic cyanate with chlorine:



Upon further addition of chlorine, the cyanate is decomposed to carbon dioxide and nitrogen:



The caustic soda is fed into the suction side of the chlorinating pump at a sufficient rate to maintain a pH above 8.5 at the discharge side of the chlorinator.

The second tank is primarily a holding tank to increase the time the waste is in contact with the chlorine before entering the sewer. If the chlorination is carried out properly, most of the excess chlorine should be used up by oxidizing a part of the cyanate formed to carbon dioxide and nitrogen before the waste enters

TREATMENT OF ACID ALKALI WASTE

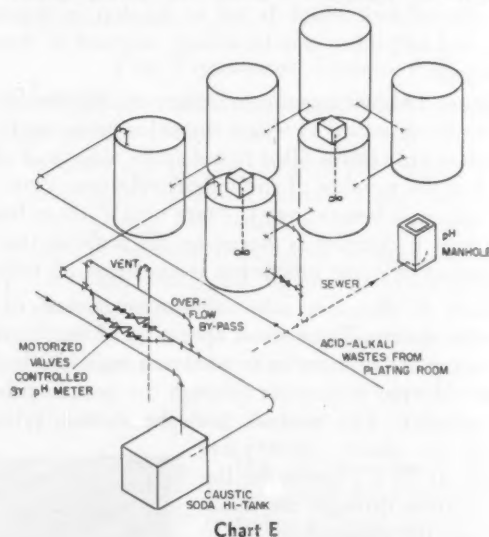


Chart E

TREATMENT OF STRONG CYANIDE

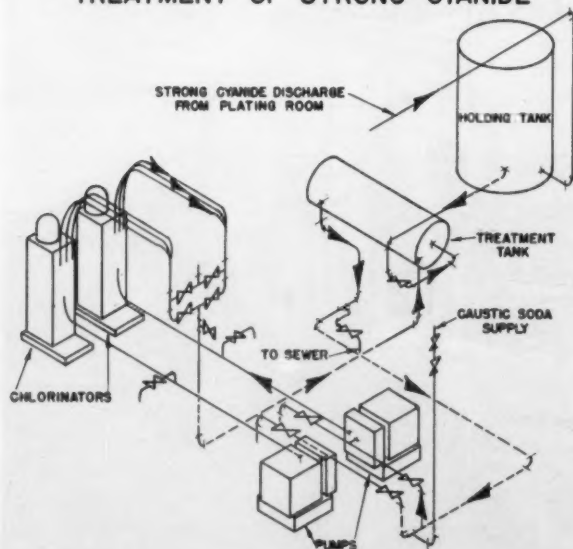


Chart D

the sewer. The control of the amount of chlorine and caustic used is manual, and it is difficult to prevent the use of an excess of chlorine at times. This is expensive but not harmful inasmuch as it is all used up in the preliminary oxidation of local sanitary sewage.

The possibility of using automatic controls for feeding the chlorine and the caustic soda is being investigated. We understand that a control instrument based on the potential change which takes place during the oxidation of the cyanide radical to the cyanate is about to be placed on the market, but we have no details of the equipment. If not too costly and complicated to the point of excessive maintenance, the installation could be very much worth while.

The concentrated cyanide waste treatment system is shown on Chart D. It consists of a 2,000 gallon holding tank into which the strong cyanide waste is collected by a second drainage system. When sufficient concentrated cyanide waste has been accumulated, about 350 gallons is run into the 750 gallon treatment tank and a

(Concluded on page 64)

Electrodeposition of Lead

European Practice and Opinion

By Edmund T. Richards, Berlin, Germany

DURING the last two decades electrodeposition of lead has been developed and improved to such an extent that it is now possible to produce dense deposits of considerable thickness as economically as any other coating of the same type and protective value. A number of processes and electrolytes have been developed and successfully applied which produce satisfactory lead deposits of practically any technically required thickness.

It has been customary to compare the old types of lead plating with zinc plating, pointing out the disadvantageous tendency of the former to react cathodically towards the base metal, iron or steel, i.e. to cause corrosion of the base metal wherever the lead deposit was porous, while zinc plating, reacting anodically towards the base metal, protects the latter galvanically even where the iron is exposed to the atmosphere by pores or injuries in the deposit. This objection has now been eliminated by the fact that modern lead plating processes permit of the production of perfectly dense lead films of minimum thickness.

Coating Thicknesses

There still remains a very considerable divergence of opinion with regard to the minimum thickness of lead deposit required to ensure sufficient protection against atmospheric and chemical corrosion under the various conditions of application in question. According to F. W. Hay, a thickness of only 0.0008" suffices to protect iron and steel against atmospheric corrosion for a considerable time, while H. Kurrein considers a thickness of only 0.0004" sufficient as far as ordinary porosity tests can be considered as evidence.

However, these and similar figures must be regarded with skepticism from a practical point of view since, under actual conditions of wear, deposits are exposed not only to a variety of straight atmospheric influences and other incidental corrosive actions (especially in shore climates or in normal industrial atmospheres), but to mechanical erosion of different kinds and intensities. These considerations do not include the use of lead plated articles in the chemical industries where they are exposed to acid and alkaline vapors and solutions of varied degrees of chemical activity, which require comparatively heavy lead platings, of course.

There can be no doubt that the figures for the minimum thicknesses of lead electrodeposits suggested by W. Blum in 1919 must still be accepted, and there is no reason why this should not be the case since nothing fundamental — apart from the absence of

porosity in commercial lead plating — has been changed since that time. Blum considered thicknesses of 0.001" and upward to represent minimum figures for all practical applications. A comparison of numerous industrial and government specifications covering lead deposits indicate, as an average, a thickness of from 0.0008" to 0.0012" for general purposes including atmospheric corrosion, home application, etc., and a thickness of from 0.0012" to 0.002" for industrial atmospheres. Much thicker lead deposits are required for chemical application, the weight of the deposit being governed by the kind and intensity of the chemical corrosion involved. An average of different specifications yields a range of from 0.004" to 0.008" although, for certain special purposes, lead deposits 0.2" thick have been specified. Figures of this type are rare exceptions, of course. They apply to lead plated articles used in connection with dilute sulphuric acid solutions and other strongly corrosive substances or with strongly erosive effects, such as moving sand, etc.

Plating vs. Hot Dipping

Modern lead plating processes, in connection with efficient plating plants and equipment render the production of these heavy lead deposits technically and economically possible, even in competition with hot lead dipping. Chief advantages of lead plating, in contrast to hot lead dipping, are the higher corrosion resistance, the higher degree of uniformity and regulating ability and the much more pleasant appearance of the galvanic products. It must also be considered that the dipping process is impossible with base metals such as cast iron, steel, aluminum. Steel can be hot dipped only if the lead contains small percentages of tin. Copper and copper alloys also are with difficulty lead plated by the dipping process unless they are first plated with nickel or tin. Electroplating avoids the internal stresses due to the temperatures of hot dipping. It also avoids the disadvantageous characteristic of hot dipped lead of forming alloys with some of the base metals.

The only characteristic disadvantage of lead plating is the comparatively low degree of hardness, as well as a slightly lesser degree of adhesion, although the hardness and adhesion properties exhibited by correctly applied lead deposits suffices for most technical purposes. There have been many attempts to improve the hardness of lead deposits, for instance by codepositing other metals but, up to the present time, there has been no real cure for this difficulty.

It is not the purpose of this article to discuss the characteristic and specific properties of electrodeposited lead; attention must be called to the numerous special publications on this subject and to the attached index of literature. It will be attempted, however, to offer some detailed information on the most important lead plating processes and their application to the various technical purposes in question.

Types of Lead Baths

If it is attempted to classify all the numerous compositions of electrolytes recommended for lead plating, it will be found that at least ten different groups of electrolytes can be distinguished. Practically all of these compositions have been pronounced perfect by their inventors, but very few have really been found satisfactory even for certain special purposes if their application has to be effected under commercially acceptable plating conditions. It may be possible that this evaluation of the majority of the processes recommended for this purpose may be unjust to one or the other lesser known electrolytes, but misjudgments of this type are usually due to lack of information with regard to the electrolytic and chemical details of the process. Most of the lead electrolytes now employed in commercial plating are not very sensitive and can easily bear a certain amount of "playfulness," but a number of the recent combinations published appear to be so sensitive that even slight departures from a very narrow range of operation are bound to lead to difficulties.

The large variety of constituents of lead plating baths recommended include the following: oxalates, acetates, lactates, cyanides, nitrates, perchlorates, fluosilicates, fluoborates, plumbates, dithionates, sulphonated phenols, formamides, ammonia, etc., etc. Of all these groups only four acid groups of electrolytes have been found to operate reliably under practical operating conditions. During the last few years, another, fifth group of electrolytes, the alkaline tartrate baths, have been found to operate highly satisfactorily under certain definite operating conditions. (See V. P. Vedotieff, First Internat. Electrodep. Conference, London. Advance copy, 1937.)

The four chief groups of acid lead electrolytes, fluosilicic acid, fluoboric acid, perchloric acid and phenol-sulphonic acid electrolytes differ from the alkaline electrolytes in that they permit of the deposition of comparatively heavy coatings (about 0.004" upward) within economic plating periods since it is possible today to operate with current densities of 30-50 amp./sq. ft. and higher.

There is little difference of quality between the products of these four main types of acid lead electrolytes where the deposits do not exceed 0.004" thickness, while considerable differences prevail in the case of heavier lead deposits. It is a general principle that inorganic electrolytes requiring comparatively small quantities of organic additions will always prove more stable in the end than organic electrolytes. Another general rule of equal importance is to compound the electrolytes of as few constituents as possible. Electrolytes containing few but well defined salts will always

operate more reliably than the complicated long-tail recipes sometimes found in technical literature.

Fluosilicic Acid Baths

The first electrolytes of this type were developed by A. G. Betts for the refining of lead, preliminary investigations on this problem having been conducted by F. Habers. The electrolytes invented by Betts were the first to deposit lead in a dense and smooth layer of uniform structure, in form of sponge metal or single needles. The first electrolyte for lead plating proper, as recommended by A. G. Betts and E. F. Kern (1904) was composed as follows:

1. Lead fluosilicate 13.5%
- Free fluosilicic acid 6.5%
- Operating temperature 70°F.
- Current density 10-20 amp./sq. ft.

Practical experience as well as the experimental work carried out by Betts, Kearn, H. Senn (1905) and others soon indicated that the technical properties of the lead deposits improved with increasing concentration of the electrolyte or with rising current densities and that the disadvantages of more dilute electrolytes could not be eliminated by liberal additions of gelatine. H. Senn recommended the following bath which, if prepared according to specification, yields lead deposits of good technical all-around properties:

2. Lead 4.8%
- Fluosilicic acid 11%
- Gelatine 0.015 oz./gal.

The preparation of this bath is rather tedious and, since suitable chemicals are available for this purpose, it appears to be more satisfactory to compound this electrolyte as follows:

3. Lead fluosilicate 12 oz./gal.
- Fluosilicic acid 10 "
- Gelatine 0.02 "
- Operating temperature 70°F.
- Current density 5-10 amp./sq. ft.

A more concentrated bath, operating at higher current densities was developed by A. G. Reeve:

4. Lead fluosilicate 26 oz./gal.
- Fluosilicic acid 4 "
- Glue 0.06 "
- Operating temperature 95-100°F.
- Current density 45 amp./sq. ft.

This bath represents the slightly modified bath recommended by Reeve.

A more recent bath of this type was developed by H. Krause:

5. Lead fluosilicate 11 oz./gal.
- Fluosilicic acid 8 "
- Gelatine 0.015 "
- Operating temperature 100°F.
- Current density 10 amp./sq. ft.
- Voltage 0.15-0.20 V.

Organic substances such as gelatine and glue are added, as in many other types of electrolytes, to improve the structure and the density of the deposit. Other highly molecular weight or colloidal substances recommended and used for this purpose are cresol, phenol, betanaphthol, cresylic acid, peptone, pyrogal-

lol, hydroquinone, extract of aloes, oil of cloves, etc. Some of these substances, such as gelatine, also cause a certain, although slight, increase in hardness of the deposit.

Another factor of importance in regulating the density and physical properties of lead deposits from these baths is the operating temperature. It may be considered a general rule that, with all other conditions equal, finest structures and densest deposits are obtained at minimum temperatures. Whenever possible, the temperature of these baths should not be permitted to rise above 60-70°F.

The effectiveness of these colloids in the various baths depends on the operating conditions in question, on the concentrations of the electrolyte, composition of salts and on the condition of the surfaces to be plated, although this factor is of practical importance only during the first stages of the process. Gelatine and glue are used more frequently. The operating mechanism of these substances is rather complicated; the final effect is, however, that they are deposited in between the crystals, preventing crystal growth and ensuring the formation of a small-grained structure as long as all the other conditions of deposition are adapted to this purpose. These conditions are:

- a) sufficiently high lead concentration
- b) sufficiently high current densities (up to a certain limiting value)
- c) sufficiently high degree of acidity
- d) low operating temperatures

Excessively high current densities must be avoided as they are bound to induce coarsely crystalline structures similar to those caused by high operating temperatures.

Low current densities induce coarse lead deposits of similar appearance chiefly in the presence of insufficient colloidal substances and if the electrolyte contains too much lead.

Attention is called to the fact that lack of colloidal substances in baths of this type, apart from facilitating the formation of coarse-grained structures, may also be responsible for poor throwing power. If the free acid content of the electrolyte is sufficiently high and the metal content is not too high, lack of throwing power is probably due to insufficient quantities of colloidal substances in the bath. In view of the fact that the throwing power of acid lead baths is comparatively low as it is, these three factors must be carefully considered.

It is obvious from the above deductions that no hide-bound rules can be submitted for the elimination of structure troubles. Metal concentrations, current densities, acidity and operating temperatures must be "just right," i.e. they must not be too high or too low, if fine-grained structures are to be obtained, and that is exactly what is required of all other factors.

A characteristic disadvantage of fluosilicic acid baths is their gradual decomposition at the anode, the $PbSiF_6$ decomposing into SiO_2 and PbF_2 . The decomposition products result in anode sludge.

The cathode efficiency of these electrolytes is approximately 89%, and the anode efficiency slightly more than 100%, the difference in current efficiencies

resulting in a gradual consumption of fluosilicic acid in the bath.

Fluoboric Acid Baths

The fluoboric acid electrolytes offer a number of important technical advantages above the fluosilicic baths. The most important of these advantages are:

- a) Lead can be deposited directly on steel surfaces, although a short copper strike is of advantage
- b) The grain is considerably more refined and uniform than that ordinarily obtained from fluosilicic baths, if the most favorable operating conditions are maintained
- c) The favorable operating range is considerably wider, so that the temperature, metal concentration, current density, etc. can be changed to a much greater degree in order to attain certain effects without inducing disadvantages of another kind
- d) The fluoboric acid baths do not tend to decompose as much as the fluosilicic acid baths
- e) The electrolytes are more easily and simply produced from commercial chemicals.

This type of bath was discovered by *Leuchs* (who also made the first discoveries of the fluosilicic acid bath) and developed by *A. G. Betts, W. Blum, W. Pfanhauser* and *Fr. Fischer*.

The fluoboric acid baths consist exclusively of basic lead carbonate, boric acid, hydrofluoric acid and some auxiliary addition such as glue, the fluoboric acid being formed in this solution by the reaction between hydrofluoric acid and boric acid. Lead fluoborate and fluoboric acid concentrates, such as are generally employed in the U. S., are not readily available in Europe. A typical composition of this type frequently employed consists of the following:

6. Basic lead carbonate	22 oz./gal.
Hydrofluoric acid (50%)	35 "
Boric acid	15 "
Glue	0.03 "
Temperature	60-70°F.
Current density	1-20 amp./sq. ft.

The current density can be raised to 30-40 amp./sq. ft. if the metal concentration is increased and the bath agitated. It is not advisable to raise the current densities above 10 amp./sq. ft., however, even if the concentration is increased considerably if heavy deposits are to be produced. Indeed, it is often recommended to maintain even lower current densities as long as the structure of the deposit does not become too coarse. If high current densities are preferred in concentrated electrolytes of this type, the baths must be subjected to mechanical stirring. The current density can then be raised to 60-75 amp./sq. ft. without endangering the structural qualities of the deposit.

A very concentrated bath of this type has been developed by *W. Blum* and modified by *A. Pfanhauser*. This bath is as follows:

7. Basic lead carbonate	35 oz./gal.
Hydrofluoric acid (50%)	70 "
Boric acid	30 "
Glue	0.05 "
Temperature	70°F.
Current density	100 amp./sq. ft.

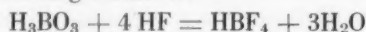
This bath must be agitated uninterruptedly. Its chief advantage is that, in spite of the comparatively very high current densities, the deposit remains dense and smooth. The fine-grained structure is also due in part to the high degree of acidity of the electrolyte and to the high current densities. It is absolutely necessary, however, to stir the electrolyte continuously. Air must not be used in the bath for this purpose; agitation must be effected mechanically to prevent spongy plating.

If very heavy lead deposits are required, the following bath can be employed:

8. Basic lead carbonate 40 oz./gal.
Hydrofluoric acid (50%) 70 "
Boric acid 30 "
Glue 0.06 "
Temperature 70°F.
Current density 90-100 amp./sq. ft.

It is advisable in every case to commence plating with comparatively low current densities and to increase them gradually; the author has obtained best results by starting with 10 amp./sq. ft. and raising the current density to 100 amp./sq. ft. within the first one or two hours. The plating period is not unduly lengthened thereby, while the results obtained are always more reliable and uniform.

A number of other combinations have been recommended for this type of bath, but none of them has been able to improve on the results obtained with the baths made up of lead carbonate, hydrofluoric acid and boric acid, in which the fluoboric acid is formed by reaction of the hydrofluoric acid with boric acid as per the following formula::



Attention is called to the fact that this formula merely represents the quantitative constitution of the fluoboric acid; the real molecular composition of this compound is bound to be different due to the strong polymerization of this acid.

An excess of fluoboric acid, up to a certain limiting value determined by the other factors, does not influence general conditions unfavorably but tends to refine the grain. It also counteracts the tendency towards treeing. Refining of the grain is also improved by increased current densities although, beyond a certain narrow maximum range, further increases of current density increase the tendency toward treeing at the edges. An excess of boric acid in the electrolyte is desirable because it counteracts decomposition of the fluoboric acid and, accordingly, the precipitation of lead fluoride. The temperatures should not be permitted to rise beyond room temperature, i.e. much above 70°F. in order to prevent coarsely crystalline structures.

Perchloric Acid Baths

This third group of lead electrolytes has also been found valuable for numerous purposes in European plants. The deposit produced is satisfactory and the general results are reliable as long as operation and maintenance of plant and processes are carried out with due care and in according with specifications. The solution exhibits a few minor disadvantages which can easily be eliminated by suitable construction of plant.

This group of lead baths was developed simultaneously in the U. S. and in Germany, i.e. by *F. C. Mathers* and by *M. Schlöter*. Mathers' bath was composed as follows:

9. Basic lead carbonate 8 oz./gal.
Perchloric acid 5 "
Oil of cloves 0.05 "
Temperature 70°F.
Current density 20-30 amp./sq. ft.

The first German bath, as patented by *Siemens and Halske AG*, in 1909, had the following composition:

10. Lead perchlorate 12 oz./gal.
Perchloric acid 3 "
Oil of cloves small amounts
Current density 10-20 amp./sq. ft.

W. E. Hughes recommended the following solution:

11. Lead perchlorate 6 oz./gal.
Perchloric acid 3 "
Peptone, glue or oil of
cloves 0.07 "

while a group of electrolytes used in Europe exhibits the following range of composition:

12. Lead perchlorate 6-8 oz./gal.
Perchloric acid 2-3 "
Peptone 0.03-0.06 oz./gal.
Temperature 110-140°F.
Current density 30-40 amp./sq. ft.

The relatively high current density is permissible only in strongly agitated baths and at operating temperatures of from 100 to 150°F. Stirred electrolytes at operating temperatures of 60-70°F. (room temperature) permit current densities of not more than 20 amp./sq. ft. while, with unstirred electrolytes at room temperature, the current densities must not exceed 10 amp./sq. ft., with average values of 2.5 to 5 amp./sq. ft.

The perchloric acid baths are characterized by high anodic and cathodic efficiencies, their absolute stability under practically all normal operating conditions, their high degree of electric conductivity and the dense and smooth lead deposits produced by them. Other advantages are freedom from treeing, perfect solubility of the salts making up the electrolyte and freedom from polarization (due to the formation of superoxide at the anodes).

The throwing power of these solutions is not particularly favorable, especially in moderately acid types of solution. Lead plating of deeply profiled articles therefore requires the use of auxiliary anodes. The same applies to all acid lead baths, by the way.

Anodes consist of pure lead. Hard lead anodes should never be employed for this purpose, as the antimony contents are not deposited on the cathode but precipitate out as a sludge. The active surfaces of the anodes are adapted as much as possible to the cathode faces. The interior anodes used with hollow articles should be provided with separate current supply and control in order to permit exact regulation of the weight of the lead plating produced.

A collative economic disadvantage of perchloric acid solutions is the high cost of the chemicals required, if compared to the fluosilicic and fluoboric acid baths. This disadvantage is not very important, however, and

is easily balanced by the various important technical advantages of perchloric acid electrolytes. These advantages are so pronounced that, for many purposes, the perchloric acid bath really takes first place among the various lead baths in question.

A very peculiar factor sometimes acting against the use of this group of electrolytes is the idea held by some practical platers that perchlorate solutions exhibit explosive properties. This belief is due to occasional slight explosions actually experienced in handling apparatus and freshly plated material contaminated with the dried residues of these solutions. The fact is that perchlorate solutions are not any more explosive than water, but that dried crusts of lead perchlorate actually tend to spontaneous combustion initiated by electric sparks, mechanical shocks or blows, etc. These explosions are irksome or exciting rather than dangerous, but they can be avoided by cleanliness in handling all articles moistened or soiled with these solutions.

Baths which have been partly used up by chemical solution of lead can be regenerated by the addition of sulphuric acid to a small portion of the electrolyte. Lead sulphate is precipitated, of course. This is filtered off and the clear solution is then poured back into the plating tank.

Phenolsulfonic Acid Baths

This fourth type of acid lead solution appears to have been developed almost simultaneously in the U. S. and in Germany, i.e. by *A. G. Betts* and by *M. Schlöter* (in 1908). They had been used to some extent previous to and during the first world war but have been superseded by the other solutions and methods described above. The most well-known electrolyte of this type is composed as follows:

- | | |
|--------------------------------|-------------------|
| 13. Lead phenolsulfonate | 26 oz./gal. |
| Free phenolsulfonic acid | 1.2 " |
| Glue | 0.3 " |
| Current density | 5-30 amp./sq. ft. |

Dithionate Baths

A fifth group of acid lead electrolytes are formed by the dithionic acid solutions developed by *F. C. Mathers* and *R. L. Bateman*. These baths possess a number of valuable advantages, their chief disadvantage being the high material costs. In view of the fact that, in spite of their own characteristic merits, these electrolytes do not offer any decided advantages over the first three types of baths described above, the very considerable difference in cost has prevented a more than local application thus far. It is for this reason that these solutions were repeatedly tried for lead refining purposes, the anode and cathode current efficiencies amounting to practically 100 percent, but the disadvantage of cost also renders this application of the dithionic acid solutions economically impossible.

The two dithionic acid baths most generally known have the following compositions:

- | | |
|-----------------------------|-----------------|
| 14. Lead dithionate | 5% |
| Dithionic acid (free) | 2% |
| Cresol | 0.8% |
| Gelatin | 0.15% |
| Current density | 10 amp./sq. ft. |

- | | |
|-----------------------------|-----------------|
| 15. Lead dithionate | 3.5-4.5% |
| Dithionic acid (free) | 1.8-2.2% |
| Glue and betanaphthol | 0.005% |
| Current density | 10 amp./sq. ft. |

The anode and cathode current efficiencies amount to practically 100%. The acid contents must be brought up to the mark regularly as they are gradually decreased during operation.

Alkaline Baths

Alkaline solutions are rarely used for lead plating under practical operating conditions. They are not suited for comparatively heavy deposits but may occasionally yield fair results for thin lead plating of deeply profiled sections, the relatively high throwing power rendering these solutions particularly suitable for this purpose.

The main disadvantages of these baths, apart from the impossibility of producing heavy lead deposits, are the comparatively low current efficiencies and the high voltages required. The latter disadvantage is not shared by the tartrate electrolytes, however, which operate with voltages of up to only 0.5 volt.

The tartrate solution most commonly employed in Europe and developed by *Siemens* and *Halske A.G.* exhibits the following characteristics:

- | | |
|-----------------------|-----------------|
| 16. Lead oxide | 14 oz./gal. |
| Rochelle salt | 15 " |
| Caustic potash | 8 " |
| Gelatine | 0.07 " |
| Temperature | 110-120°F |
| Current density | 10 amp./sq. ft. |
| Voltage | 0.3 volts |

Another bath of American origin, which has also been tried out occasionally in Europe with varying results, is composed as follows:

- | | |
|------------------------|-------------------|
| 17. Lead acetate | 10 oz./gal. |
| Caustic soda | 30 " |
| Sandarac, etc. | 0.4-1.2 oz./gal. |
| Temperature | 175-200°F. |
| Current density | 6-10 amp./sq. ft. |

While bath No. 17 gave rise to frequent difficulties, porous deposits being obtained in most instances, the previous bath (No. 16) has been improved to a point where it is now possible to obtain dense and bright lead deposits. Nevertheless, the main difficulty characteristic of all alkaline lead baths has not been overcome even with this solution.

Lead Anodes

The anodes employed in lead solutions usually consist of pure soft lead strips or profiled sections. In view of the throwing power of acid baths, which is not particularly good, it is advisable to adapt the surfaces of the anodes as much as possible to the cathode faces, so as to avoid considerable differences of distance between opposite anode and cathode areas.

The solubility of pure lead anodes is satisfactory at low and high current densities, maintaining the metal contents of the electrolytes practically constant. The anode and cathode current efficiencies in acid electrolytes are 97-100 percent. The anode areas must be

at least as large as the cathode areas, but larger ratios are frequently desirable. If the anode area is too large in proportion to the cathode area, the correspondingly diminished current density induces the production of coarse crystal structures, especially in acid electrolytes rich in metal.

Hard lead anodes, sometimes recommended to diminish the softness of the lead deposit (one of the characteristic disadvantages of lead plating in contrast to hot-dip coatings) must never be employed. The antimony contents are not transported to the cathode faces but precipitate out as an anode sludge. Anodes made of pure lead do not give rise to difficulties such as excessive sludge formation, rough surfaces, etc., which are bound to occur with the common grades of commercial lead.

Conditions are not as favorable in connection with alkaline lead electrolytes. The anode current efficiencies in these solutions rarely exceed 30-50 percent, and it is necessary for this reason to add lead salts to the baths at regular intervals in order to avoid impoverishment of the metal contents which, on their part, are bound to increase the general difficulties in connection with the anodes. However, since on account of these and other difficulties alkaline lead solutions are rarely employed, these questions are not of considerable technical importance at this moment.

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PLATING ROOM WASTE DISPOSAL

(Concluded from page 58)

check made of the cyanide and caustic present. The chlorination of this batch is started and the flow of caustic soda is regulated so that the pH of the solution will be 8.5 or above at all times. The chlorination is continued until an excess of chlorine is present, the rate being adjusted so that the solution temperature does not rise above 120°F. The system is then shut down and allowed to stand for an hour. If at the end of this period, tests indicate that the chlorine residual is above one part per million the solution is run to the



Figure 3. Tank field at rear of plant.

sewer. If not, the chlorination is continued until an excess of chlorine remains after standing for one hour.

The acid and alkali waste treatment system is shown on Chart E. The system consists of six 3,000 gallon rubber lined steel tanks through which the waste flows in order to mix it and prevent too wide a variation in its composition. Caustic soda is added to the last tank to maintain a pH of the effluent above 6 before it empties into the sewer. The pH of the waste waters in the sewer will be above 7 due to the higher pH of the waste coming from the dilute and concentrated cyanide treatment systems. The amount of caustic soda to be added is controlled by means of a recording Leeds and Northrup pH controller which actuates motor-driven valves.

Electrodes on another recording pH meter are located in the sewer below the point where the waters from the three systems meet, as a check on the operation of the whole system. Figure 3 shows the various outdoor facilities installed for the treatment. The three 15,000 gallon caustic soda storage tanks are adjacent to the railroad spur. Nearest are the six mixing tanks for acid-alkali neutralization. Behind are the tanks for treatment of dilute cyanide. Adjacent to these is the 2,000 gallon holding tank for concentrated cyanides, and the treatment tank is adjacent to the wall.

Very little difficulty was experienced in starting up the waste treatment system, and it has been running satisfactorily since.

Some Factors In Spray-Silvering

By P. B. G. Upton, G. W. Soundy and G. E. Busby

Introduction

IN recent years metallizing processes involving the chemical reduction of aqueous solutions of metallic salts have come into considerably greater prominence than formerly. The demands of the wide variety of applications in which such processes now figure have resulted in the development of the so-called spray-silvering technique where separate sprays of silver solution and reducing solution from a special gun are combined and the mixed spray directed onto the surface to be silvered. A number of these processes are now in fairly wide use and were referred to in an earlier publication¹ by one of the present authors. The present publication refers to a particular process developed for use in electrotyping and employing a solution of formaldehyde for the reduction of silver ammonio-nitrate solution; most spray-silvering processes are, however, basically similar and it is probable that similar considerations will be applicable to all.

The essentials of the present method will first be briefly described.

Description of Process

(1) TREATMENT OF THE SURFACE BEFORE SILVERING

Treatment of a glass surface before silvering with a stannous chloride solution has been shown by a number of authors^{2,3,4} to increase the initial rate of formation of a subsequently deposited silver mirror. Banks and Upton⁵ found that this effect was due to the deposition of a film of a basic stannous compound (e.g. hydroxide or basic chloride) on the surface and further that a hydrophilic film having appropriate reducing properties could be produced on a hydrophobic surface by immersing it for a few seconds in a stannous chloride solution containing an anionic detergent. With this development it became immediately practicable to sil-

^{*}Reprinted from *J. Electrodepositors' Tech. Soc.*

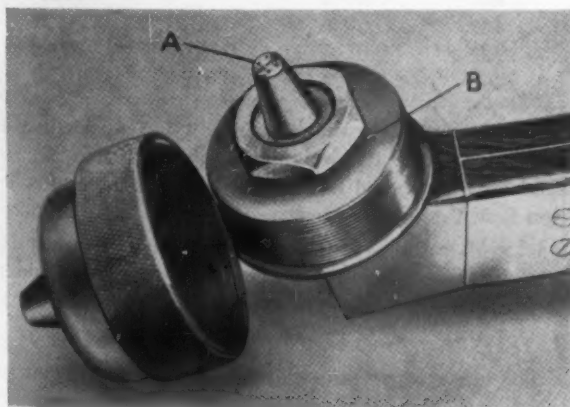


Figure 1. Nozzle of spray gun.

ver a much greater variety of materials and a "sensitizing" solution of this type was used in the present work.

(2) SILVERING

Silvering was effected by directing a mixed spray of formaldehyde and silver ammonionitrate solutions onto the previously sensitized and washed surface by means of a suitably designed spray gun.⁶ The spraying head of the gun is shown in Fig. 1. The spray gun consists essentially of a single nozzle, made in stainless steel, through which pass a number of channels. The ends of these channels can be seen as six holes arranged

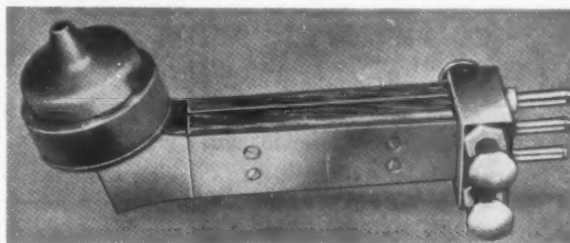


Figure 2. Complete spray gun—prototype model.

symmetrically around a central hole (A in Fig. 1). Fig. 2 shows the complete gun (prototype model) in which the nozzle is covered with a cowl. By means of channels through the handle of the gun the two solutions are led separately to the nozzle tubes from which they emerge separately from alternate holes. Compressed air is fed into the space between the cowl and the nozzle through the large holes (B in Fig. 1) surrounding the base of the conical nozzle. The solutions are thus impelled forward in fine sprays which eventually mix some distance from the nozzle. The central hole in the cone also discharges air and this assists in intermingling the liquid sprays. Approximately suitable concentrations for the silvering solutions and the supply of the reactants to the gun were first determined using the method of Fizeau as quoted by Hepburn⁷ for rough estimation of the amounts of silver deposited and having regard to the character of the silver deposit and the need to silver an electrotype mold in as short a time as might be reasonably convenient. In this way provisional concentrations for the solutions were fixed at 2% silver nitrate (i.e. 2.4% silver ammonionitrate) and 3% formaldehyde with a supply of equal volumes of each solution to the gun. This concentration of formaldehyde is more than sufficient to reduce all the silver salt in the silver ammonionitrate solution but it was obviously preferable to increase the speed of reaction by increasing formaldehyde concentration rather than silver in view of the comparative cheapness of the former. The use of a higher ratio of formaldehyde to silver gave somewhat dark discolored silver deposits. The three solutions used were therefore as follows.

SOLUTION (1)—SENSITIZER

Approximately 4.8% of stannous chloride in 3.5% hydrochloric acid (just sufficient to prevent hydrolysis of the stannous chloride) and containing 1% of Permal WA or 0.4% of Permal BX. Permal is a commercial (Imperial Chemical Industries) preparation of a sodium alkyl naphthalene sulphonate, WA being a standardized preparation with an inert diluent. The solution was prepared by dissolving 120 g. of stannous chloride dihydrate in 100 ml. of concentrated hydrochloric acid, warming if necessary to obtain a clear solution, diluting to 2¼ liters and adding 250 ml. of 4% Permal BX solution.

SOLUTION (2)—SILVER SOLUTION

2.4% silver ammonionitrate prepared by dissolving 50 g. of silver nitrate in about 2 liters of water adding ammonia solution till the initial precipitate just re-dissolves and making up to 2½ liters with water. In order to avoid the possible danger of forming explosive silver nitride it is important to ensure that (1) all the silver nitrate is dissolved before adding ammonia, and (2) that ammonia is not added to a concentrated (>4%) silver nitrate solution.

SOLUTION (3)—REDUCING AGENT

3% formaldehyde solution prepared by diluting 185 ml. of formalin (40% formaldehyde) to 2½ liters.

The pressure of the air feed to the gun was fixed at 24 p.s.i. giving an air flow of 10 cubic feet per minute of free air, this air pressure being the minimum needed to give a continuous finely divided spray. A measured spraying distance (i.e. the distance from nozzle-tip to plate) was used in each experiment.

With these provisional arrangements the following points were examined.

A. Quantitative Effects

1. GROWTH OF THE SILVER FILM WITH TIME

A number of clean glass plates, each of an area 2 dm², were prepared, sensitized by a standardized time of treatment (10 secs.) with No. 1 solution (brushed on in a thin film) washed for 10 secs. in running water, and silver sprayed for various measured periods. The rate of flow of the solutions through the gun was measured by weighing the supply bottles and tubes before and after a measured time of spraying. The results are shown in Fig. 3.

It will be seen that a rapid initial rate of deposition is

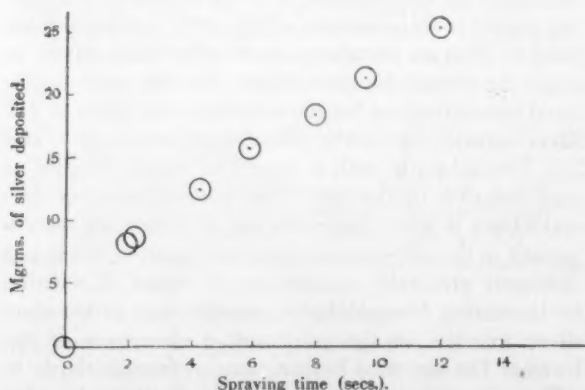


Figure 3. Growth of silver film with time. Spraying distance 20 ins. Rate of solution flow 95 mls./min.

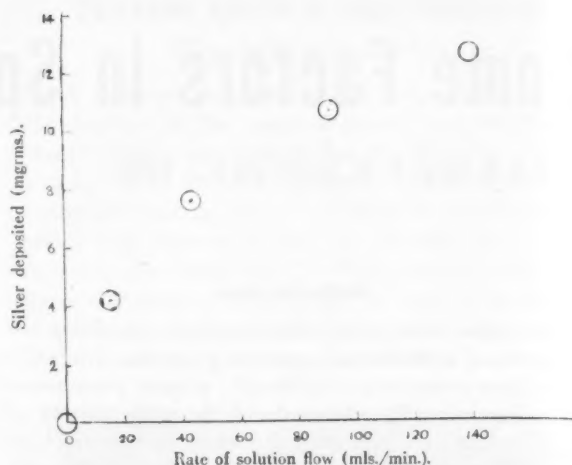


Figure 4. Silver deposited v. rate of solution flow. Spraying time 4 secs. Spraying distance 24 ins.

quickly superseded by a slower and approximately linear rate, the efficiency in the latter stage being approximately 14.2% (i.e. 14.2% of the silver used is deposited on the plate). The rapid initial rate may be attributed (1) to the reaction with the silver solution of the reducing film left on the surface by the sensitizer, and (2) possibly to some exceptional catalytic effect of the initially fine particles of silver deposited; the change to linear growth with time presumably marks the stage where the silver deposit covers the glass completely and assumes the normal characteristics of the mirror silver.

2. EFFECT OF RATE OF FLOW OF SOLUTIONS

A number of glass plates prepared as above were sprayed for a standard period (4 secs.) and with a fixed spraying distance (2 ft.), at various rates of solution flow. Table I shows the amounts of silver deposited, and Fig. 4 a graph of the results. The last column in Table I shows the amounts deposited calculated as a percentage of the amount of silver used in each case; this method of expression is included to give an indication of the general level of efficiency though the value cannot be an absolute one since the growth of the silver film is not initially linear with time.

TABLE I

Rate of flow mls./min.	Silver deposited gms.		% of silver used
	Actual	(b)	
16	0.0042	—	31.0
44	0.0076	0.0070	20.25
92	0.0107	0.0101	13.65
140	0.0126	0.0124	10.50

These results are much as might be expected. The relation between the weights of silver, M and M_1 respectively, deposited in constant times at rates of solution flow V and V_1 respectively is given (approximately) by $M_1 = M\sqrt{V_1/V}$. Using the initial value at 16 ml./min. as a basis this relation gives the values under (b) in Table I in fair agreement with the actual results.

3. EFFECT OF SPRAYING DISTANCE

The effect of varying the distance from the gun to the surface being silvered was determined by weighing the amount of silver deposited, in a standard time (5

secs.) at a fixed rate of solution flow (50 ml. per min.) at various "spraying distances." The distance measured was from the plate surface to the tip of the gun nozzle. Results are shown below and plotted in Fig. 5.

TABLE II

Spraying distance ins.	Silver deposited grams	% of silver used
3	0.0174	32.8
6	0.0163	30.7
12	0.0152	28.7
15	0.0147	27.7
18	0.0125	23.6
21	0.0104	19.7
24	0.0097	18.3

These results are perhaps a little less obvious than those from varying the rate of solution flow. We take it however that the effect of decreasing the spraying distance is to increase the effective air pressure on the area covered by the air stream from the gun with a consequent reduction in the local thickness of the solution layer. Assuming as we may that the reaction at the catalyst (silver) surface greatly outweighs in importance the reaction on the bulk of the solution, an increased efficiency of deposition should then result. This condition will, however, obtain only for that part of the plate on which the spray impinges, the rate for the remainder of the plate corresponding to the normal film thickness appropriate to the particular rate of flow of solution and since the spray is of conical form the effect of varying spraying distance is correspondingly reduced.

It is thus evident that desirable features from the standpoint of efficiency are as short as possible a spraying distance and as low as solution flow as possible; the effect of this combination of conditions is shown in Figure 6 which shows the growth of the silver film at a spraying distance of 3 ins. and rate of solution flow 28 ml./min.

The slope of the straight line portion (Fig. 6) is equivalent to an efficiency of approximately 41.3%. A check on the comparison with greater spraying distance at 2 ft., the other conditions being unchanged, gave a silver deposit of 0.0061 grams in 5 secs.

4. EFFECT OF CONCENTRATION

The effect of varying the concentration of the solutions (each solution being diluted proportionately in

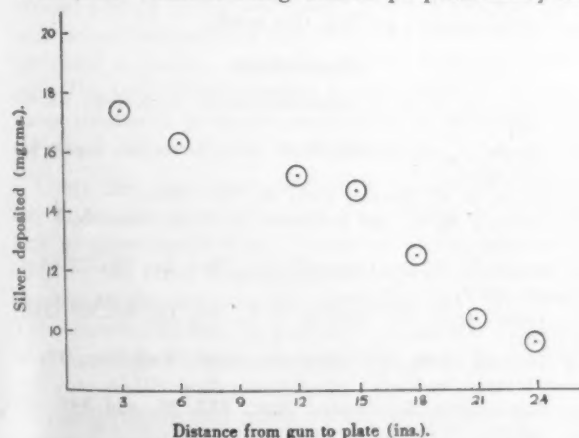


Figure 5. Silver deposited v. spraying distance. Spraying time 5 secs. Rate of solution flow 50 mls./min.

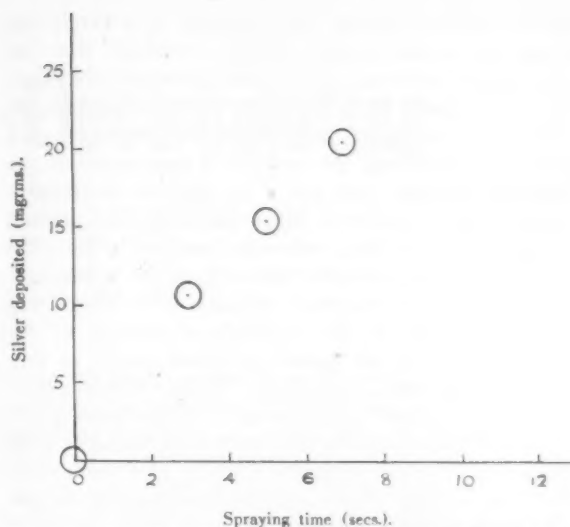


Figure 6. Growth of silver film with time. Spraying distance 3 ins. Rate of solution flow 28 mls./min.

each case) gave the following results. Conditions used were 12-in. spraying distance, 5 secs. spraying time, and rate of solution flow 28 ml./min.

TABLE III

Solution (AgNO ₃) Concentration %	Silver deposited grams	% of silver used
0.5	0.0075	102.7
1.0	0.0124	83.8
2.0	0.0161	54.4

It therefore becomes apparent that with a spraying distance of 12", which is ample for convenience, efficiencies of the order of 100% can be obtained. The rate of silvering is, of course, somewhat slower with the more dilute solutions but this is appreciably offset by the efficiency increase. The approximate time to produce a deposit of 10 mg. on the standard 2 dm² glass plate under various conditions has been computed below.

TABLE IV

Rate of flow ml./min.	AgNO ₃ concentration %	Spraying distance inches	Time to produce 10 mg. of Ag sec.	Efficiency %	Ag used mg.
28	0.5	12	6.7	100	10.0
28	1.0	12	4.0	84	11.9
28	2.0	3	2.8	60	16.6
28	2.0	12	3.1	54	18.5
50	2.0	12	3.3	28	35.2
50	2.0	3	2.5	37	26.7
95	2.0	20	3.0	16	60.8

Under suitable conditions therefore, the rate of deposition and the efficiency obtainable can compare quite well with electrodeposition, particularly for smaller articles.

B. Qualitative Effects

1. ADDITION AGENTS

One serious defect of many spray silvering methods, including that used in the present work, is the tendency for rapidly deposited silver films to exfoliate over large portions of their area as soon as the thickness of the deposit attains a certain minimum value. The defect occurs very readily indeed on any smooth surface

(glass, polished plastic, etc.) though it is rarely encountered on matt surfaces. It was considered that this effect might be due to rapid crystal growth in the silver film as postulated by Kohlschütter⁸ for normal mirrors, and that it might be modified by the presence of a protective colloid and the addition of gum arabic to the reducing solution was found to give a satisfactory result. A further criticism which can be levelled against the simple formulation mentioned earlier is the difficulty in securing adequate deposits in the subsurface regions of deeply recessed surfaces. This effect was largely overcome by the addition of sucrose to the reducing solution, an expedient found useful in this regard by Silverman and Howe.⁹ While optimum concentrations for these additions have not yet been determined, the following solutions have been found to give substantially foolproof results. The use of a lower concentration of gum arabic may be desirable where the color of the mirror is important.

<i>Reducing Solution</i>	<i>Silver Solution</i>
25 ml. of formalin (40% CH ₂ O)	0.7% silver nitrate
20 g. sucrose	+ Ammonia sufficient to dissolve the
2 g. gum arabic	ppt first formed.
Water up to 1 liter	

2. CONTAMINANTS

Commercial experience in electrotyping shops has given some useful information on the effects of some contaminants encountered. Salts of heavy metals other than silver have given notable trouble, e.g., copper, zinc, or lead should not be present in concentrations greater than a few parts per million. The necessity for precautions is therefore obvious in electroplating or electrotyping shops where comparatively large quantities of such salts abound. Alkali metal neutral salts, e.g. sulphates of sodium, potassium, magnesium, on the other hand, appear to exert little detrimental effect on the silvering process even in concentrations of the order of 1%.

Loose metal particles which may be transferred to the surface being silvered (particularly in molding from a matrix in electroforming applications) produce characteristic effects. Notably with copper and zinc, a black spot with a dark "tail" appears in the silver deposit around and below the metal particle; with lead (presumably due to its lower solubility) the effects of a metal particle extend less beyond the confines of its own area.

Fingerprints may produce serious local inhibition of silvering. Care is therefore necessary in handling surfaces to be silvered; cleaning with methylated spirit or by brushing with 10% "Teepol" (octodecyl alcohol sulphate) is an effective cure.

C. Applications

As has been earlier remarked, the prime reason for the development of this process was the need to apply an electrically conducting layer to the molded matrix (wax or plastic) used in reproducing type or half-tone originals in electrotyping, and this silvering process has now become very general practice in that application. However, there are obvious possibilities in other directions and in fact appreciable applications have been found outside the printing industry, notably in the

allied field of electroforming, and to some extent in the decorative metallizing of plastics. In the former case the process has encouraged the use of electroforming in producing many precision components which would be certainly expensive and in many cases difficult or even impossible to produce by normal engineering techniques. We feel that this is a field with great possibilities which is likely to see considerable expansion in the future.

One difficulty with decorative silvering produced by this method is that in most cases the silver film must be protected from abrasion and tarnishing on handling, and except for occasional cases where it has been possible to use the obverse of a silvered transparent plastic component as the working surface, a lacquer has had to be applied. This lacquering invariably tends to produce some yellowing of the reflected light (excellent gilt effects can in fact be readily obtained) and it has not been found possible to preserve entirely the whiteness of the silver. That the yellowing appears to be an optical effect—presumably due to the silver particles remaining of colloidal size—has been demonstrated by buffing the silver film before lacquering with a soft buffing wheel; when the silver is afterwards lacquered the defect does not arise. Incidentally an interesting plate silver type of finish can be readily achieved by buffing a fairly thick sprayed silver deposit and no difficulty arises if the deposit is initially adherent (cellulose acetate is a good basis material in this case).

The use of the "sprayed" silver deposit as the basis for decorative electroplating on plastics is of course obvious, and the process has been used for this purpose.

Conclusions

While, owing to pressure of other work, it has not been possible to carry this study as far as might be thought desirable, we feel that this limited work is sufficient to show that spray silvering can be a valuable and economical additional tool in the field of coating with metals in its extension to deposition on electrically non-conducting base materials. It is to be hoped that this limited study will induce course be extended to a full understanding of the process.

Acknowledgment

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Water Impurities and Electroplating

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MOST of us have probably at some time or other been asked the old catch question; what is the most used industrial solvent? The answer is, of course, water. This fact is doubly true in the plating industry where a larger amount of water than any other raw material is employed for producing the plate.

In spite of the importance of water in plating it is only in approximately the last ten years that control of water quality in plating has been practiced to any great extent. In fact, what appears to be the first paper pointing out some of the troubles in plating that are due to water impurities appeared as late as 1939.³⁰ Since that time there has been increasing interest in the subject and a number of papers have appeared discussing the matter.^{3, 5, 7, 10, 12, 13, 14, 21, 33, 35, 39, 44, 45} Some of these include summaries of the effect of water impurities on various plating baths. This paper presents an expanded and current summary of this type. The data, which are presented in Table I, are taken mainly from the literature. The paper also presents a description of various water treatment processes applicable to removing impurities from water used in plating.

Literature references to the effect of water impurities in plating are not too frequent, there being an especial lack of quantitative data. A number of the references cited in the table are, therefore, papers briefly mentioning an impurity in the particular bath involved. This situation is due, in part at least, to the difficulty of setting definite limits on impurities since their effect will vary widely with many factors such as current density, temperature and additives employed. In a few instances it is possible to set such limits; for example, an upper limit of approximately 50-100 parts per million

of iron in bright nickel baths. However, this is the exception rather than the rule. The data in the table are intended, therefore, to assist only in indicating the source of trouble or the possibility of it. They are indications alone and should not be taken as completely definitive. Since to be useful such a table must be concise, information has been in many cases condensed. Reference to the original paper is, therefore, advisable in many cases for expanded information or to form a more valid opinion of the effect.

In order to apply the information in the table it is necessary of course to know the analysis of the water being used. An analysis can frequently be obtained from the water supply company. Failing this, or, if a private supply is involved, an analysis can be made by any of a number of qualified analytical laboratories, or companies providing this service. Alternately, most of the determinations in water analysis are not difficult and can be carried out in the simplest chemical laboratory, according to the explicit directions provided in various reference books.^{1, 2} In addition, if analyses are performed in the shop a record can be maintained of the variations in water impurities. This may be a valuable procedure, since many water supplies vary widely and troubles due to varying impurities are frequently difficult to trace.

Impurities in Water Supplies

The various impurities which are usually present in water are as follows:

Calcium* and Magnesium*: Usually present in natural water. Cause water hardness. In plating mainly cause trouble due to precipitates they can form.

Sodium* and Potassium: Usually present in water.

Iron*: Frequently present. Usually up to only around 1 part per million concentration. Frequently present as insoluble $\text{Fe}(\text{OH})_3$. Iron can cause much trouble in plating baths.

Copper, Zinc, Lead and other heavy metals: Very infrequently present in water but may be introduced by waste discharge. Frequently have adverse effect on plate.

Manganese: Sometimes present, frequently as insoluble oxide.

Ammonia: Sometimes present; usually due to pollution.

Aluminum: Infrequently present; usually as aluminate anion.

Chloride*: Usually present in water. Chloride anion

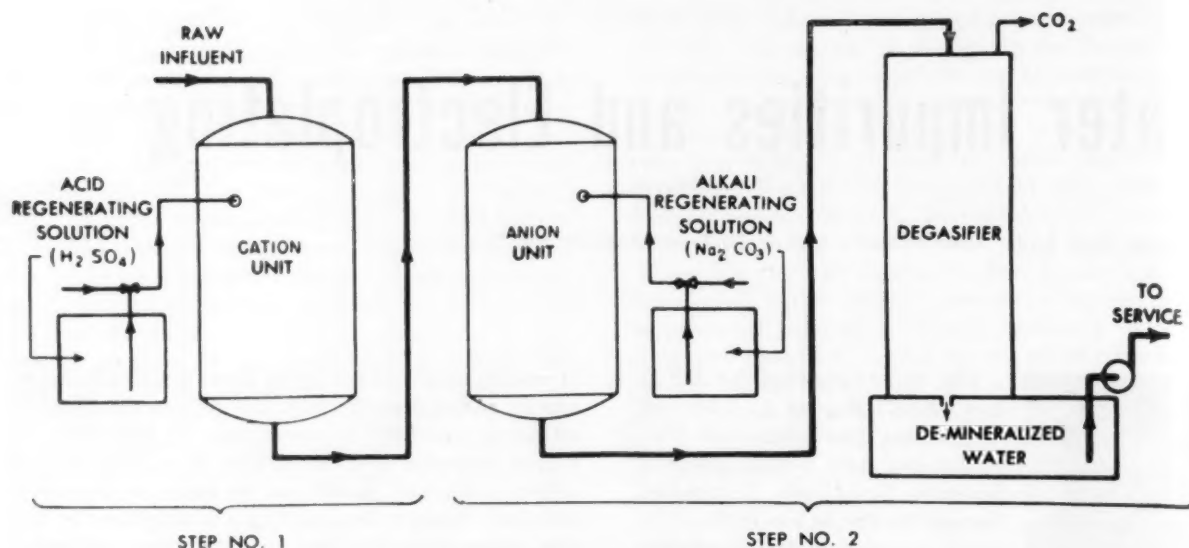


Figure 1. Flow diagram of demineralizing process. Step No. 1: Replacement of metallic cations by hydrogen (H-ion) converts salts present in raw water into corresponding acids (HCl , H_2SO_4 , H_2CO_3). Step No. 2: Removal of acids formed in Step No. 1. The Cl and SO_4 are exchanged in the anion unit, and the H_2CO_3 decomposes into H_2O and CO_2 , escaping in the degasifier.

is not to be confused with free chlorine added to sterilized water.

Sulfate*: Usually present in water.

Nitrate*: Sometimes present; usually in fairly low concentration.

Phosphate: Infrequently present in natural waters; sometimes added to treated waters.

Carbonate*: Bicarbonate and carbon dioxide; usually present in water. The anions, bicarbonate and carbonate, constitute water "alkalinity." They are converted to carbon dioxide gas at pH 4.

Fluoride: Occasionally present in natural waters. Recently being added to a number of public water supplies at about 1 ppm to strengthen children's teeth.

Silica*: Usually present; upper limit is generally about 20-25 ppm.

Turbidity*: Suspended matter of any sort is termed turbidity.

Color and organic matter: Color is almost always due to organic material, frequently humic acids leached from decaying vegetable matter. Iron and manganese also can cause apparent color.

Hydrogen sulfide (sulfides): Found in water in some areas up to a few ppm.

Normally, water is analyzed only for the items in the above list which are marked with an asterisk. Other impurities are usually determined only when their presence is suspected, or if specifically requested.

In evaluating the effect of water impurities in any particular plating shop, it is, of course, important to estimate the possible concentration of the impurities in the plating bath. Analysis of the plating bath itself for impurities is, of course, a direct method of obtaining such data. Methods for this type of analysis are to be found in references describing various baths⁴⁴ or such sources as the methods proposed by American Electroplaters' Society Project 6. A knowledge of the quantities of water entering and leaving the bath will, of course, allow an estimate of the concentration of any

water-borne impurities in the actual bath. The amount of evaporation from a plating bath at room temperature is not too great although, in hot, air-agitated baths, it can approach 5% per day.^{3, 12, 39} Usually drag-in from preceding rinse baths and water added to make up for drag-out losses are more important. Calculation of drag-in and drag-out figures has been dealt with quite thoroughly in the literature^{11, 29, 34, 35, 37, 38, 39, 41, 44, 50} and will not be discussed in this paper.

The question of water impurities is not solved by merely defining it. The offending compounds must be removed. Perhaps the most popular process for purifying water in the plating industry at present is two-step demineralization, which has been mentioned by a number of authors.^{3, 4, 5, 10, 17, 21, 33, 36, 41, 44, 45} This process, which will be described below, produces a water similar to distilled water. In addition, zeolite water softeners have been used to soften water for plating baths, cleaner baths and rinse tanks.^{3, 7, 28, 30, 32, 42} This process removes only the water hardness cations of calcium and magnesium.

Water Softening and Demineralizing

Zeolite softening and demineralizing both employ ion exchange materials. The process of ion exchange consists of exchanging ions in solution for other ions which are present on granular insoluble materials called ion exchangers. The ion which was originally in solution of course remains behind on the ion exchange material after the exchange. For example, zeolite softening employs one of the various types of cation exchange materials in its operation. The cation exchanger, sometimes called a Zeolite, can be thought of as granular insoluble anions, with which are associated sodium cations. When water containing hardness, which is calcium and magnesium cations, is passed through a bed of such a material, the sodium ions are exchanged for the calcium and magnesium. The water emerges containing only sodium cations and hence completely soft. When all the exchangeable sodium ions have been exchanged, the cation exchanger is "regen-

erated" by passing a strong sodium chloride brine through it, which removes the calcium and magnesium and replaces the sodium ions.

As may be seen, zeolite softening is useful for removing only cationic materials in the ionized state from solution. That is, only elements or compounds present as positive ions can be removed; metals present as insoluble precipitates, or anionic complexes will not be removed. For example, ferric iron in water is usually hydrolyzed to $\text{Fe}(\text{OH})_3$, which is very insoluble. This compound would best be removed by filtration rather than by zeolite softening.

Demineralizing, or deionizing, is similar to zeolite softening, although there are basically two consecutive processes involved. The first is a hydrogen ion exchange step, similar to zeolite softening, except that the cation exchanger is regenerated with an acid such as sulfuric and exchanges hydrogen ions instead of sodium ions for all the cations in the water. The cation exchanger material must, of course, be of a type which will not be decomposed by the acid conditions involved and the equipment must be capable of withstanding acid.

The second step of demineralizing consists of an anion exchange step. In the first step the impurities have been converted to their corresponding acids by exchanging the cations for hydrogen. In the second step the anions are exchanged for hydroxyl anion, thus the impurities are completely removed and water substituted in their place. Anion exchange materials used in the second step are granular insoluble materials employed in beds and in equipment similar to cation exchangers. When exhausted, they are regenerated with a solution of an alkali, such as sodium hydroxide, or sodium carbonate. References to Fig. 1 will elucidate the above description.

Types of Demineralization

There are three general types of demineralization employed at present: two bed demineralization using weakly basic anion exchangers, two bed using strongly basic anion exchangers and mixed bed demineralization. Figure 1 diagrams the first type. In this type a weakly basic anion exchanger which will remove only strong acids is employed. The weak acids such as silica and carbon dioxide (generated from various carbonates in the raw water), are not removed in the anion exchange unit. This is usually not troublesome since carbon dioxide can be removed by air stripping it

from the water in an apparatus called a degasifier or by use of vacuum in an apparatus called a vacuum degasifier. Silica is present very infrequently in excess of about 25 ppm and, being rather inert, is not usually objectionable in plating operations. Furthermore, weakly basic anion exchangers have the dual advantages of being very efficiently regenerated and of using an inexpensive regenerant alkali, sodium carbonate (soda ash).

If it is necessary to remove silica from the water, the second type of demineralizing using a strong base type anion exchanger is employed instead of the weakly basic type. This type of ion exchanger is regenerated with sodium hydroxide (caustic soda), and is capable of removing both silica and carbon dioxide by ion exchange. A degasifier or vacuum deaerator is usually included, however, between the cation and highly basic anion unit, since this is the cheapest means for removing carbon dioxide. It is also well to note at this point that the highly basic type of anion exchanger is less efficiently regenerated than the weakly basic type.

The third method of demineralizing makes use of cation and highly basic anion exchangers just as does the second. In this process, however, both exchangers are put into the same tank instead of into two separate units. They are then mixed together by blowing air through the bed. The main advantage of this system is that extremely pure water may be obtained, due to the multiple, alternate contact between the water and the anion and cation exchangers. When the ion exchangers are exhausted, they are separated by hydraulic classification, since they are manufactured in such a way as to make the cation exchanger of higher specific gravity than the anion exchanger. After they are separated, it may be seen that there is no great difficulty in regenerating them by passing sodium hydroxide through the upper layer (anion exchanger) and acid through the lower layer (cation exchanger). A distributing spider mounted at the position of the interface between the

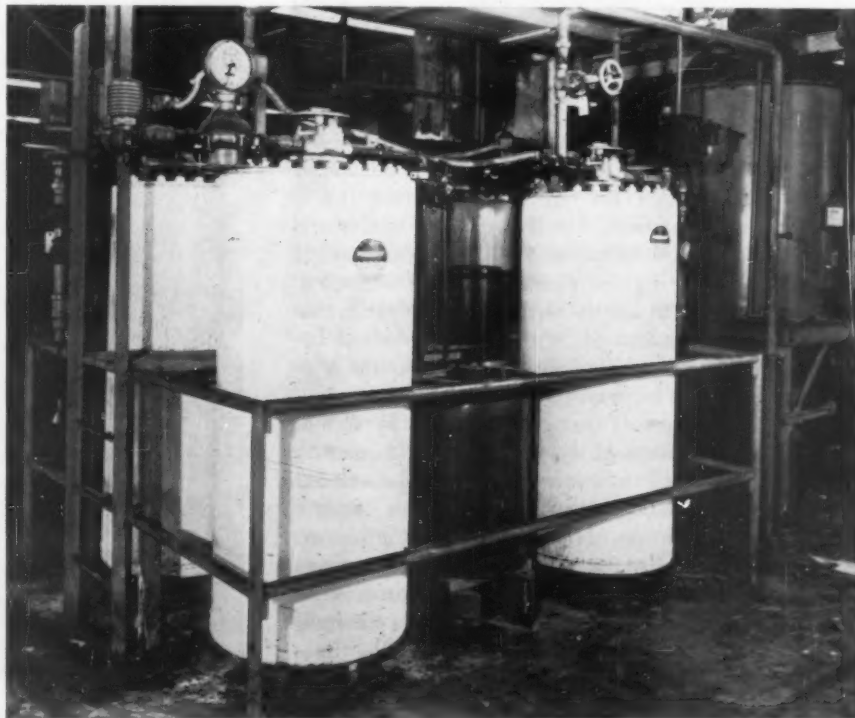


Figure 2. Small size two step demineralizer. Second pair of units may be seen in the rear.

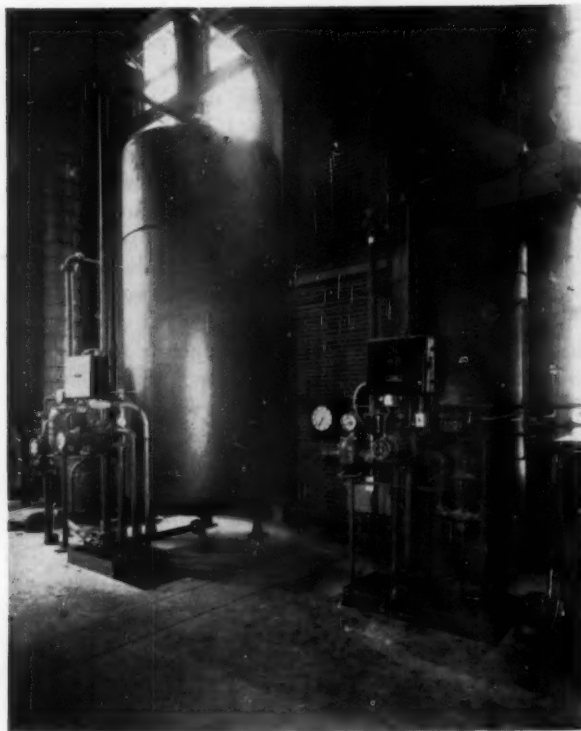


Figure 3. Larger type of the two-step demineralizer. A degasifier may be seen in the left rear corner.

two layers is used in this operation. The equipment cost of this type of demineralizer is roughly the same as the two-step type with highly basic anion exchanger. The operating costs, however, are usually higher due to the necessity of removing carbon dioxide, formed from carbonates in the raw water, by anion exchange. Mechanical removal by degasification is much less expensive, but obviously impossible in this case.

Although it is always advisable to leave the design and construction of such equipment as zeolite softeners and demineralizers to persons familiar with such work, a brief description of some of the steps involved in the operation and a few of the factors involved in the design may be interesting and of assistance in understanding their operation. The capacity of ion exchangers is usually given in units of kilograins, expressed in terms of CaCO_3 , per cubic foot of exchanger in place in the unit. This terminology is more time-honored than convenient, but if the water analysis is known in parts per million as CaCO_3 , the amount of exchanger to treat a given amount may be estimated. The parts per million are divided by 17.1 to get grains per gallon. This multiplied by the gallons desired between regeneration and divided by 1,000 gives the kilograins which must be removed. An approximation of regenerant requirements can be calculated by use of the fact that, in softening, the regenerant salt quantity needed is usually $1\frac{1}{2}$ to 3 times the theoretical amount or the amount stoichiometrically required to displace the hardness taken up during the run. Cation exchangers on the hydrogen cycle require in the range of $1\frac{1}{2}$ to $4\frac{1}{2}$ times theoretical regenerant acid, weak base anion exchangers from only slightly over theoretical to about $2\frac{1}{2}$ times and strong base from $2\frac{1}{2}$ times theoretical to as much as 6 times. Capacities and regenerant dosages must be suited to the conditions and

economics involved and should be calculated by persons familiar with such work. There are of course many other chemical and mechanical factors involved in design work such as proper bed depth, flow rates, contact times, flow distribution, regenerant concentration, etc.

In use, water is passed downflow through the bed of ion exchanger in the unit until the ion exchanger is exhausted. It must then be regenerated. The first step is an operation known as backwashing. Water is flowed upward through the ion exchange bed until the granules are loosened, regraded and any dirt is washed out. The regenerant chemical solution is then introduced and allowed to flow through the exchanger, usually downflow. Next the remaining regenerant is rinsed out, usually with a downflow water rinse. The unit is then ready for operation again.

Ion exchange processes are useful for the removal of ionized impurities in water. These water purification processes, mainly demineralization, are the ones most in use in the plating industry. One of the reasons why a demineralizer is of advantage is that as mentioned above most water supplies vary in composition. Some supplies vary quite rapidly and widely with respect to their dissolved salt content. Such swings in water quality can cause troubles which are most difficult to analyze since they come and go. Demineralizing plants will eliminate the possibility as well as removing the ionic constituents from the water which can cause so much trouble. Another advantage of demineralizing is that the demineralized water can be used in the rinse tanks. Usually when a demineralizing plant is installed in a plating shop sufficient capacity for this use is provided. Use of demineralized water in the rinse avoids staining of the plate due to deposits of the solids nor-

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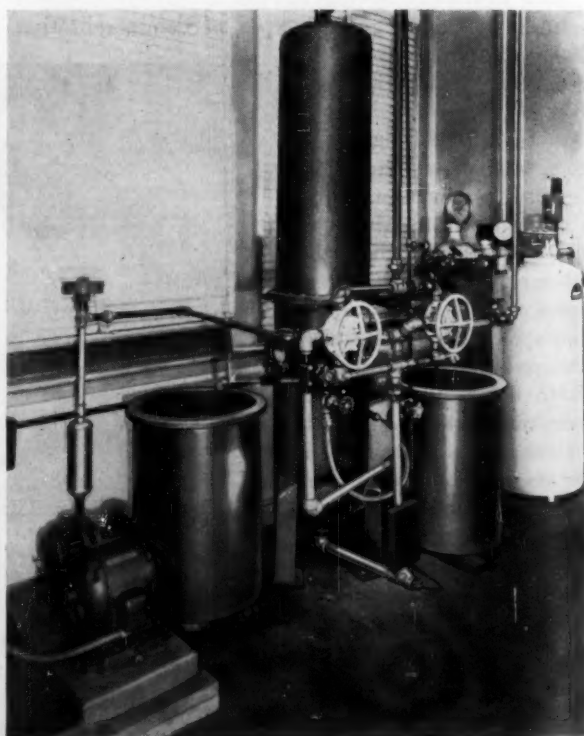


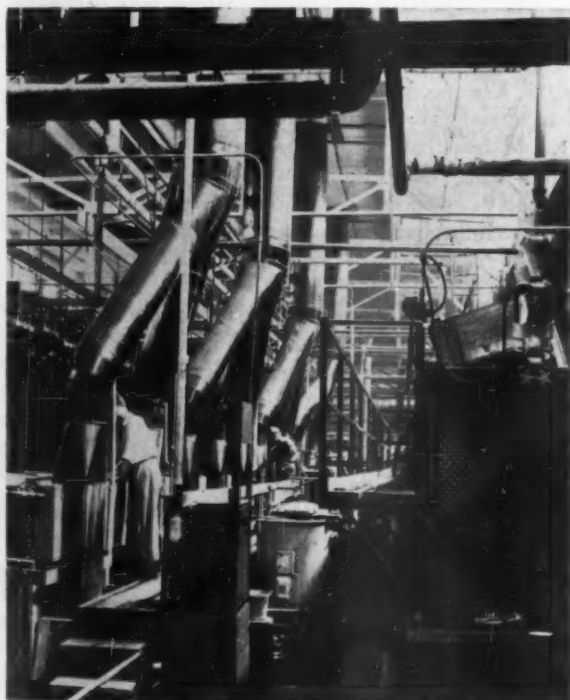
Figure 4. Small size mixed-bed demineralizer.

Efficient Fume Removal

THE Winters and Crampton plating plant in Grandville, Michigan recently found a solution to a problem which is a perennial source of difficulty for many finishing plants, that of controlling steam, heat, smoke, fumes and other irritating and damaging vapors from the plant area.

Corrosive fumes are produced as a by-product of the process involved in plating stove and refrigerator hardware at the plant. These fumes were undesirable from the standpoint of both the health of their employees and the life of their plant equipment, so that it was necessary to install a system to take care of exhausting them. After careful consideration of the situation, it was decided to use four split-duct exhaustive ventilators on the roof of the building with duct work attached to whichever tanks are the source of the fumes.

The units selected are direct motor-driven fans of the type illustrated, with divided housings and weather tops. The fan wheel itself is 24 inches in diameter with a tip speed of 11,000 fpm. The 5 HP motor is mounted in separate chamber of the unit, open to the atmosphere but isolated from the fumes being exhausted.



(Photos courtesy DeBothezat Fans)

Duct work connected to the tanks where stove and refrigerator hardware is plated gather the corrosive fumes at their source. They are then carried to the roof and exhausted.



Four split-duct ventilators installed on the roof of the Winters and Crampton metal plating plant at Grandville, Michigan, are doing a satisfactory job of fume removal. The weather tops on the units may be easily removed giving direct access to the fan parts for servicing.

Factors Leading To Choice of System

The situation was carefully studied before the exhaust system was installed, and many factors were instrumental in leading to this particular choice of system. Winters and Crampton needed a system which would be as simple as possible to install and which would take a minimum of space, since the equipment in the plating room necessarily takes up a large area.

Placing the ventilators on the roof, with the duct work leading directly up to them, made it possible to omit elbows, sleeve band connections, and separate motor mounting and cover. By positioning the fans and ductwork in this manner, it was possible to make the ductwork short and direct with only very slight turns — a desirable feature in keeping the duct resistance down to a minimum.

Special attention had to be given to the fact that some of the fumes being exhausted are of a corrosive nature. It is always best if the damaging vapors can be collected as near their source as practical and, at Winters and Crampton, it was possible to gather them right at the source of emission by connecting the duct work to the tanks. The choice of the particular fan unit was also determined by the corrosive nature of the fumes. In the split-duct units which were chosen, the motor is protected from damaging effects of the fumes because it is mounted in a separate chamber between the air flow ducts of the unit.

Since the fans were placed on the roof of the plant, it was necessary to consider the effects of weather conditions. Accordingly, units with weather tops were chosen. For added protection, the housings were covered with six coats of a weatherproofing material. The weather tops are removable, giving easy access to the units for servicing.

Satisfactory Performance

The plant engineer, Norman Davis, reports that the

system's performance is equal to or in excess of its rated capacities and says that the ventilators are doing a very satisfactory job of removing the unwanted fumes.

The Winters and Crampton installation is an example of "system ventilation" applicable to many types of industrial operation. The object in system ventilation is to control heat or unwanted vapors at the source with a combination of ducts and exhaust fans. Industrial exhaust systems may also be of the "general ventilation" type, in which exhaust fans without ducts are mounted in the roof, walls, or monitors. The object here is total replacement of air in the area to be exhausted. In either case, engineers have found that, to get the most out of an exhaust system, it should be designed individually to suit each situation's special needs. Experience has shown that several basic principles are important in considering fans to be used in industrial installations.

Fan Selection and Placement

Location of the fan and intake areas is of prime importance in obtaining the maximum economy and efficiency from an exhaust system. Fans should be placed to blow with prevailing winds, and intake areas should be positioned to take advantage of positive pressures produced by prevailing winds. Fans should never be placed to blow opposite each other if it can be avoided. Separation by at least six fan diameters is desirable in locating the units. It is also advisable to have fan intake areas at least 20 percent greater than the fan wheel discharge area.

Noise is an important factor where employee morale is a consideration, and care should be taken to select just the right fan. The fan tip speed is suggested by ventilating engineers as one index of relative loudness. Composition of the air that will surround the motor is another important factor to consider. A motor mounted out of the air stream or an explosion proof motor is essential if the air being exhausted is hazardous in composition. When cold weather is a factor, tempered air should be introduced. Where air will exceed normal temperatures, an insulated motor is suggested or external cooling can be provided.

Where duct work is to be used in combination with exhaust fans, experience and research have shown several additional points to be important. Collecting the fumes or vapors as near their source as possible is desirable. Where turns can be avoided, they should be, but if they are necessary, long radius elbows will keep the resistance to a minimum.

In selecting the fan unit to be used with a duct system, it is best to choose a fan with a reverse capacity beyond the pressure volume point determined by the duct resistance. Coating the fan parts with special paints, plastics, or alloys is advisable if abrasive or corrosive conditions are encountered.

The Winters and Crampton installation shows good application of these basic principles. The careful designing of their exhaust system is an example of how well thought-out engineering has paid off not only in solving a problem basic to those industries using chemical processes in manufacturing, but also in providing economical operation and satisfactory performance.

WATER IMPURITIES

(Continued from page 72)

mally present in untreated water. Hence the subsequent operations necessary to remove such stains are avoided.

It is for this reason that they have been discussed at some length. Further information may be obtained from various reference books.^{46, 47} Figures 2, 3 and 4 show some typical demineralizing installations.

What A Demineralizer Will and Won't Do

Most city water supplies and some private water supplies contain little besides inorganic ionized contaminants. These are well suited for ion exchange processes. The two-step demineralizing process using weakly basic anion exchangers is capable of producing water containing only the order of 5 to 10 parts per million of ionized solids from the usual water supply. The silica content is not changed and carbon dioxide is removed to residuals of around 5 parts per million by degasification. Two-step demineralization with highly basic anion exchangers produces about the same or slightly less ionized solids, residual silicas ranging down to as low as 0.01 parts per million and no free carbon dioxide. The residual ionic compounds from both processes consist mainly of alkali metal chlorides and carbonates or hydroxides. Removal of ionized heavy metals (both cations and anionic complexes) to the parts per billion range is expected on amounts present in normal water supply. The pH of weakly basic anion exchanger effluents is less than 7 due to the residual carbon dioxide, while strongly basic anion exchangers produce a pH of approximately 9 due to conversion of a slight amount of alkali metal salts to hydroxides. The pH of such waters is of little importance however, due to their high purity and hence insignificant buffering capacity. Mixed bed demineralizers produce water of utmost purity having specific resistances of the order of 10 million ohm-cm (pure water has specific resistance of approximately 24 million ohms). This corresponds to an ionized solids content of less than 0.05 parts per million. The effluent silicas range down to as low as 0.01 parts per million. The pH is essentially 7, although very difficult to measure since the buffering capacity of the water is so low that even carbon dioxide absorption from the air changes it radically.

If un-ionized organic matter is present, it is not removed by ion exchangers, although there may be a slight absorption in some cases. This does not mean that ionized organic matter, such as acetates will not be removed in demineralizing. Even very weakly dissociated organic compounds can be taken up in some cases provided their molecular size is not too great to diffuse into the ion exchange particles. If, of course, a weakly ionized anionic material is present, a highly basic anion exchanger would be necessary to remove it.

Although ion exchange beds will also behave like a filter in removing some suspended matter from water, they should not be used for this purpose. They are not efficient in this respect and, furthermore, will become fouled with dirt if any appreciable load of suspended matter is applied to them.

(To be concluded next month)

TRADE SECRETS

COURTS CONSIDER THEM PROPERTY

By Albert Woodruff Gray

THE action by the Federal Government a few years ago against the owners and licensees of patents on metal finishing and rustproofing processes, in which the activities of these patentees and their licensees were claimed to be in violation of the anti-trust laws, collapsed before the basic legal principle that a trade secret is property.

A patent had been issued in this country in 1907 on the process of providing iron and steel surfaces *"with a protective covering adapted to render the surface thereof capable of resisting or of being infected by the action of moisture and other oxidizing or rusting influences."* This patent, approximately six years later, was purchased by a Michigan corporation along with a patent issued to one Richard, relating to the same discovery and issued at about the same time.

When the action was brought by the Federal Government years later charging that this company had attempted to and did secure a monopoly of the so-called rust proofing business by the illegal use of these patents, by conspiring with some of its licensees and by entering into illegal agreements for the purchase of the business of its most important competitors, the government was essentially charging the company with a monopoly on, and the unrestricted ownership of, the ideas and trade secrets underlying this rustproofing process.

In its review of the circumstances of this case the court, in absolving this company and its licensees of any violation of the anti-trust laws, said, *"From the day of the ancient alchemist scientists have labored to devise means for endowing the baser metals with the quality of permanency of the higher metals. There is evidence that phosphates were used to protect iron articles as early as the third century. In 1869 metals were commercially treated with phosphoric acid. It was found that this changed the surface of the metal and made the iron and steel were rust resistant."*

"At all times this company had depended for its business and commercial success upon its control of particularly patented processes and its aggressive salesmanship coupled with its policy of locating and employing able technical men to improve its products and to interest manufacturers in the use of its products and processes. These employees have been under contract to turn their inventions over to the company and to assign to it any patents issued therefor."

Owners Protected Under Common Law

To this the court added the conclusion, in relation to these secret processes and trade secrets claimed by the government to be the framework of a monopoly: *"Under the common law courts protected the owner of secret process. It would be contrary to the American sense of justice to induce an inventor to make a public disclosure of his invention and then to deprive him of the benefits of his invention by unduly restricting his right to make use of it."*

One of the first instances in this country in which our courts recognized the property right of an owner in a trade secret and the justice of extending protection to such ideas from the destruction and exploitation by competitors through disclosure and breach of confidence, occurred in a case that came from review before the Massachusetts Supreme Court over eighty years ago.

A cloth manufacturer of that state had discovered a process for making gunny-cloth from jute butts. The machinery he had perfected for implementing this process had been constructed and installed in a large factory. A contract for the confidential employment of an engineer in the construction and operation of this machinery had been made with the stipulation that information of this process should be held an inviolate secret, the employee agreeing that he would *"Consider all of said machinery as sacred, to be used only for the benefit of the owner or his assigns and by all means in his power prevent other persons from obtaining any information in regard to it such as would enable them to use it."*

The all too frequent consequences of situations of this type were characterized by a comment made half a century later by Justice Holmes of the Supreme Court: *"Whether the employers have any valuable secret or not, the employee knows the facts, whatever they are, through a special confidence that he accepted. The property may be denied but the confidence cannot be. Therefore the starting point for the present matter is not property or due process of law but that the employee stood in confidential relations with the employers, or one of them. These have given place to hostility and the first thing to be made sure of is that the employee shall not fraudulently abuse the trust reposed in him. It is the usual incident of confidential relations. If there is any disadvantage in the fact that he knew the employers' secrets he must take the burden with the good."*

In this long ago case in Massachusetts the employee left his employment with the owner of this trade secret for the manufacture of gunny-cloth and enlisted both his services and his knowledge of this trade secret in a project for the construction of another factory for the same purpose, agreeing to furnish his later associates with machinery built according to the trade secrets of his first employer from whom he had received these secrets in confidence, and to supply the details of this secret process according to the original plans and drawings he had taken with him from his former employment.

In awarding an injunction against the disclosure of these secrets and against their use in the manufacture of this product the Massachusetts court said:

"It is a policy of the law for the advantage of the public, to encourage and protect invention and commercial enterprise. If a man establishes a business and makes it valuable by his skill and attention, the goodwill of the business is recognized by the law as property. If he adopts and publicly uses a trademark, he has a remedy either at law or in equity against those who undertake to use it without his permission.

If he undertakes a new and useful invention of any machine or composition of matter he may, upon filing in a public office a description which will enable an expert to understand and manufacture it and thus afford to all persons the means of ultimately availing themselves of it, obtain letters patent from the government securing to him its exclusive use and profits for a term of years.

If he invents and discovers and keeps secret a process or manufacture, whether a proper subject for a patent or not, he has not indeed, an exclusive right to it as against the public or against those who in good faith acquire knowledge of it; but he has a property in it which a court will protect against one who, in violation of contract and breach of confidence, undertakes to apply it to his own use, or to disclose it to third persons."

Employees Are Restricted

The law laid down in this decision was echoed three quarters of a century later in an opinion rendered in a recent case before the Supreme Court of New York.

"It is asserted, in the opinion of the courts and such is unquestionably the correct rule, that the law raises an implied contract that an employee who occupies a confidential relation toward his employer will not divulge any trade secrets imparted to him or discovered by him in the course of his employment."

The restraint of the disclosure and use by others who have acquired secrets of this character by breach of confidence or good faith, is by no means restricted however, to those gaining secrets of this character directly from the owner of the trade secret. A New Jersey manufacturing firm hired a manager who eventually became president of the company to be later removed from that office by action of the board of directors. Before the termination of this association however, he had taken from the company, with which he had been associated for twenty years, records and confidential information of chemical formulas. Thus equipped, upon the termination of his association with this company he accepted a position with a competitor. The first company sued not only this former president but also the competitor by whom he had been hired, asking an injunction against the use or disclosure by either of these secret formulas and processes. In granting the injunction the New Jersey court said,

"The right of a manufacture whose goods are made by an unpatented secret process to protection by injunction against the divulging of his secret in a proper case, is now established by a well considered line of cases. These cases establish the principle that employees of one having a trade secret who are under an express contract, or a contract implied from their confidential relation to their employer not to disclose that secret, will be enjoined from divulging the same to the injury of their employer, whether before or after they have

left his employ; and that other persons who induce the employee to disclose the secret, knowing of his contract not to disclose the same, or knowing that his disclosure is in violation of the confidence reposed in him by his employer, will be enjoined from making any use of the information so obtained, although they might have reached the same result independently by their own experiments or efforts."

Trade Secrets Can Be Assigned

While this protection of trade secrets by injunction has been made applicable not only to employees and those violating a confidence reposed in them but also to others who seek to benefit from such wrong doing, the right to this protection by injunction, accorded by law to the discoverer of a trade secret is extended to the succeeding owner of the trade secret acquiring it by assignment or other method of transfer.

A metal process secret was some years ago assigned by its owner to a New Jersey corporation, accompanied with a written disclosure of the secret to the directors of the company. Later one of these directors resigned and, three years later, was the head of a company which hired both the engineer and foreman of the firm of which this man had been director, and constructed a plant for the use of these secret processes.

The defense to the action brought by the assignee and owner of these secrets was that the right to prevent any disclosure rested solely in the original owners of the trade secrets but that the right to protection of this character did not extend to subsequent owners.

"The duty of the employee," said the court in granting this injunction, "arising by contract or by confidence imposed in him, to preserve the secrets of the business was undoubtedly primarily owed to the employer.

"The right to enforce this duty of silence was a factor — indeed, a most important factor — in estimating the value of the secret. It was a part of the property in the secret. To say that the owner can sell the secret but the vendee cannot assert this right of the owner and protect the secret from revelation would in most instances place the assignee at the mercy of the assignor. In equity the contract held by and the duty owing to the owner of a trade secret is not merely assignable but the assignee of the trade secret has a part of the property right transferred; that is, the right to utilize and protect the secret passes to the assignee."

This right of the owner of a trade secret or of the assignee to protection against exploitation by others has been limited by the courts however to instances where there has been a complete disclosure of the secret, it has not been extended to the protection of a mere cursory outline of an idea from which a process or thing might or might not derive.

A Trade Secret Must Be More Than An Idea

A student at the Massachusetts Institute of Technology conceived a more or less nebulous idea of applying the principle of rectification to the separation of metals. This process had been applied in the past to the separation of such petroleum products as gasoline and kerosene but attempts at the application to zinc and lead had been unsuccessful.

While attending a lecture in distillation, according

to this student, "The idea flashed into my mind of applying the principle of rectification to the separation of metals." Shortly afterwards he disclosed this idea to the manager of the technical department of one of the big industrial plants of the country, as a process for separating metals by rectification, using the column, boiling at the bottom, condensing at the top, vapors passing countercurrent up the tower with liquid coming down the tower and taking overhead the lower boiling point constituent of the product, taking off the bottoms the higher boiling point constituent.

Unable here to make an arrangement for the exchange of his research efforts for funds necessary for continuing his studies he accepted other employment. Five or six years later he learned that this company to whom he had submitted his idea, was using this process and that a patent application had been filed for letters patent.

The idea and process to which this patent application related however, that was in use by this company, had been acquired by the company through the research work of another investigator initiated several years before this idea had flashed into the mind of this student and had later been assigned by that discoverer to the company.

The Federal Court said in refusing to interfere on behalf of this student, "*Relief has been granted in numerous cases in which a breach of confidence has been disclosed. It is to be noticed however, that in each of these cases there was a complete disclosure of the idea as well as the manner in which it was to be perfected.*" In conclusion the court added, "*Whatever idea this discoverer had about rectification, it was premature and had not reached a reasonable certitude at the time of his visit with the employees of this company.*"

In relation to circumstances of this character the court added here, "A further condition to a recovery is that the idea disclosed must be novel. A duty not to use an idea already known cannot be created by virtue of the fact that one makes a confidential disclosure of that idea. If the rule were not so restricted it is obvious that, by disclosing an idea under delusions of confidence, the person making the disclosure could thereafter prevent the confidante from subsequently making use of it, even though the idea was well known prior to the date of disclosure and open to the use of all others in the world."

A case involving circumstances of this character came before the United States District Court in Maryland a few years ago. A combination of mica and glass, a heat resistant material that combined with metals in molding and casting and employed particularly in radio frequencies, had been marketed by a New York corporation.

The discovery of this composition had been made by a British chemist and licenses for the use of the patents had been granted to two large American producers. The glass used in this composition was manufactured by a Maryland firm with which the New York manufacturer had contracted for its supply of this material, a semi-fused powdered glass known as "frit."

Some time before this incident however, two large producers in this country had been manufacturing and selling this insulating material and an engineer of this

Maryland company had been formerly employed by one of these companies in the production of this particular material. Several months after these contracts had been made with the Maryland manufacturer for the supply of this "frit" the New York company learned of the manufacture by this firm of the same material for sale in the general market.

The company protested against what it contended was an appropriation of their trade secret and followed this protest with an action for an injunction against the continuation of the manufacture of this product and an accounting for profits.

A Trade Secret Must Be A Secret

The court, in its statement of the grounds that were fatal to the success of this action for an injunction, said,

"A substantial element of secrecy must exist. Matters of public knowledge or of general knowledge in an industry are not secret any more than are those matters which are completely disclosed by the goods which one markets. A trade secret may consist of any formula or pattern, any machine or process of manufacturing or of any device or compilation of information used in one's business; and which may give the user an opportunity to obtain an advantage over competitors who did not know or use it."

This was supplemented with a catalogue of the conditions under which relief will be granted against the disclosure of such secret information.

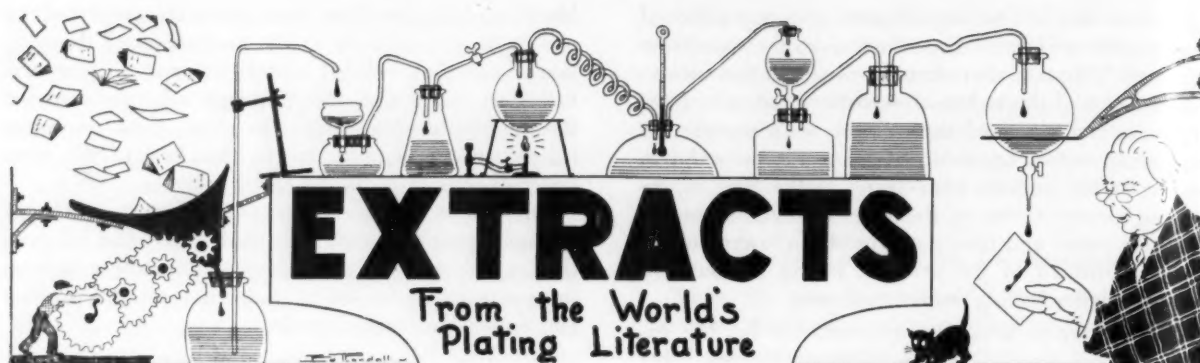
In order to entitle the company to relief it is necessary for two factors to exist: (1) that what was disclosed was of a secret or confidential character, whether in terms of formulas or in terms of means for using these formulas, namely physical plant or equipment; and (2) that the offender made use of such disclosure without permission in competition with the owner of the secret.

One who discloses or uses another's trade secret, without the privilege to do so, is liable to the other if,

- (a) he discovers the secret by improper means, or
- (b) his disclosure or use constitutes a breach of confidence reposed in him by the other in disclosing the secret to him, or,
- (c) he learned the secret from a third person with notice of the fact that it was a secret and that the third person discovered it by improper means or that the third person's disclosure of it was otherwise a breach of his duty to the other, or,
- (d) he learned the secret with notice of the facts that it was a secret and that its disclosure was made to him by mistake."

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Layout Details for Pickling Plants

P. Robert. *La Metallurgie*, vol. 84, No. 5, p. 367.

The fundamental factors in the layout of a pickling plant installation for continuous series production are a design layout which ensures rapid and regular working while ensuring at the same time the maximum of safety and comfort to the working staff. All detail stages of the processing should be carefully studied to avoid, either by premature destruction or else by virtue of insufficient productive capacity, that the production should be accidentally interrupted or even slowed down.

The pickling vats are placed on a protective base of concrete, covered with an acid-resisting coating of pitch or else on a platform of acid-proof brickwork. The first solution is relatively inexpensive but of relatively low effectiveness; the second method is most effective but fairly expensive. The comparative merits of the usual forms of bath heating systems for continuous pickling baths are as follows. (a) *Steam jet heating*: This is the classical heating method for continuous pickling baths and, if the steam jet is not directed into the body of the liquid and strikes against the wall of the vat, there will be a rapid deterioration at this place. (b) *Heating by lead coils*: Fairly large lengths of tubing are required in the tank which reduces the vat capacity. Again, the lead coils can be damaged by heavy charges into the tank of ferrous metal for example. (c) *Heat exchange units*: This is the most scientific method of heating as here the heating unit is external to the tank. The vat liquid is pumped through the heat exchanger and the hot liquid then back into the tank. For pickling liquor duties, heat exchange units of hard lead or graphite are the most suitable types.

The separation of the iron sulfate from used ferrous metal pickling baths is a necessary operation. The excess iron sulfate is crystallized out by refrigerated cooling and can then be separated either batchwise or by a continuous separation unit. A modern crystal separator unit is of reasonably small size and is capable of producing 2 tons of dry iron sulfate per hour. The acid fumes are aspirated from the tank by a suitable sized exhaust fan and often an air current is blown on the tank to assist the evacuation. A suitable

construction for the exhaust fan is rubber-lined steel sheet fabrication. The ventilating pipe ducts connecting the vat with the exhaust fan and the chimney will be either of hard wood, rubber-lined sheet steel construction or else of plastic material (polyvinyl chloride).

The complexity of modern continuous pickling plant lines with multitudinous motor drives, motorized valves, exhaust fans, pumping equipment, handling equipment etc., necessitates centralized pulpit control systems. In the pulpit, the operator has two control desks. The first desk reproduces the layout of the pipelines and indicates to him, by means of luminous lighting, the condition of operation or stoppage of the various machine units as well as the state of filling of the various tanks and vats (storage vats for used bath liquor, crystallizers, storage vats for regenerated baths); registering thermometers permit of controlling the temperature in more than say fifteen different points. The second control desk permits the operator, with the aid of push-buttons, to exercise distance control over the various motors and motorized valves. This layout is completed by interlocking arrangements between any two valves which should never be open at the same time; the opening of one of these valves will automatically cause the closure of the second associated valve.

Accuracy of Electromagnetic Coating Thickness Measuring Apparatus

J. H. Zaat. *Metalloberflaeche*, vol. 5, No. 12, pp. A185-A191.

In order to determine the thickness of non-ferrous magnetic coatings on a ferrous magnetic base metal, widespread use is made of magnetic coating thickness measuring apparatus. These measurements have the great advantage that the test is non-destructive and the coating is not damaged. It is generally stated in the technical literature that the inaccuracies with these measurements amount to a maximum of 10 per cent. Because this is not regarded as generally correct by the author, research was undertaken with one type of this coating thickness measuring equipment. That type of coating thickness measurer was used which employs a circular magnetic field. From the investigations made it was found that there are certain objections to the measurement obtained and that various conditions

must be fulfilled in order that too great an error may not be obtained with the measurement. Namely, it cannot be asserted without anything further that the measuring error is a maximum of 10 per cent, as is stated in the literature. This is because the sources of error are too numerous. Also in the literature, the sources of error mentioned below are not considered at all. The research was quite generally confined to the possibility of utilizing existing equipment designs which make use of a magnetic circular field. The influence of the relations of the permeabilities of the yoke and the armature and the influence of the thickness of the non-ferro-magnetic coating on the magnetic power flux density were studied. The power flux density is namely the decisive factor for the determination of the thickness of the non-ferro-magnetic coating. The value of the power flux density as a function of the coating thickness must be registered in some way. This can be made in various ways. First, the power flux density can be measured with a deflecting galvanometer, while a direct current flow is closed or opened in the field coil. Further, the induction in a coil on the yoke can be measured while an alternating current flows in the field coil. The induced current density is measured with a milliammeter with the use of a rectifier. Further, the self-induction in the field coil itself can be measured by means of a bridge circuit while an alternating current flows in the coil. The self-induction is measured with a milliammeter by means of a rectifier by the Graetz method. Both the induction as well as the self-induction are proportional to the power flux density.

The first step in the research was to bring the formula which covers the power flux density in a magnetic circular field into a form which agrees very well with the Ohm law of electricity. This formula is then handled so as to cover the magnetic circular field of the coating thickness measuring apparatus in the ideal case, where the lines of force of the field do not deviate. The results obtained were as follows:

1. The permeability of the yoke must be as small as possible.
2. An endeavor should be made to choose a ferro-magnetic alloy for the yoke whose permeability is, as far as possible, a constant.
3. For each permeability of the armature, there belongs only a single scale if this is directly standardized in terms of micron thickness of the non-ferro-magnetic coating and the permeability of the armature and the yoke are constant.
4. In order to obtain a perfectly correct scale for each metal of the armature, the permeability of the armature and of the yoke must be known as a function of the power flux density, i.e. the hysteresis curves must be known.
5. The measurement of the thickness of the non-ferromagnetic coating is very much influenced by inhomogenities of the armature. In order to have some assurance regarding the accuracy of the measurement, the ferromagnetic base metal on which the plated coating is applied must first be tested for magnetic homogeneity.

Inhomogenities can arise for example by localized heating during soldering, brazing or welding.

pH Paper in Plating Practice

W. Zarncke. *Metallüberfläche*, vol. 5, No. 12, p. B186.

The present market position of metals renders strict control of the pH value of plating baths desirable. For technical reasons also, as for example in the case of nickel baths, the nickel consumption and polishing characteristics are dependent on the bath factors and, in general, the deposition of the various plated metals, regarding amount, structure, degree of hardness, and adhesion are directly associated with the current relation, the metal content of the bath and the pH value. Thus, it has been established that in nickel baths, the throwing power is improved when the nickel concentration is increased in relation to the hydrogen ion concentration; on the other hand the increase of the hydrogen ion concentration of the bath improves the bath conductivity but renders more difficult metal deposition at lower current densities. There exists, accordingly, firm relationship between the various physical components of the bath. The addition of alkali chlorides effectively prevents the falling of the pH values with acid additions between pH = 5.5—6.5 and increases the stability of positive colloids and thus, accordingly, in the stability range of colloidal nickel hydroxide (between pH = 4 and pH = 6.5) harder nickel deposits are obtained. In this connection, mention should be made of the fluorides which actually dissolve the anodes with more difficulty than the chlorides and in the pH range of 5.5—6.5 do not give any appreciably better buffering effect than boric acid, but nevertheless refine the structure of the nickel and give harder deposits.

There is a fundamental difference between the normal nickel baths with higher pH values and those with a pH value below 3. The pH value of highly acid nickel baths must be just as carefully watched as with the normal rapid high speed nickel baths. A point which requires particular attention is that the pH values round about 3 are more difficult to maintain constant than the higher values. Any falling off with these baths gives a tendency to edge burning and to peeling and flaking. The protective effect of the nickel deposit from these low pH baths on the basis of the better ductility of the metal, is more favorable than that from baths with a higher pH value. Such baths, particularly nickel chloride baths with free strong mineral acid, are particularly useful in electroplating. The pH value also plays an important part as regards the bath impurities. Thus, with the strongly acid nickel baths with a pH value below 4 for example, the iron is co-deposited with the nickel and, within an adulterating range of 0.1-0.4% of the nickel content, gives brighter and harder nickel deposits. With a pH value over 5 the iron remains practically undissolved and can be filtered off in the normal way. Black streaks in the nickel plate point to zinc contamination and the pH value is then adjusted to 6.8 with soda solution, heated to 60°C., and filtered with nickel carbonate. With cobalt-nickel deposits, an increased pH value increases the cobalt content of the deposit. With pre-nickeling before chromium, it is not possible to prevent flaking of the chromium plate if the hydrogen absorp-

tion is too strong or the pH value is too high or also too low. For acid zinc sulfate baths, the golden rule is that the pH should be lower than 5 but not lower than 3.

Modern pH papers allow the pH value of the bath to be rapidly determined, with the appropriate indicator solution. It is possible to differentiate between a pH difference of 0.2. The color change with these papers is very clear and decisive and can readily be used by the ordinary bath operator for pH control.

New Automatic Immersion Polishing Process — Centrifuged Abrasive Polishing Particles

G. Hermes; *Metalloberflaeche*, vol. 6, No. 1, pp. B8-B10.

The polishing stage in plating practice is of great commercial significance as the greater part of the overall processing costs are involved in this stage. For final polish finishing, fundamentally two different procedures can be classified — decorative and dimensionally accurate final finishing. In the case of dimension final surface finishing, a considerable number of procedures and automatic machines have been developed, for surface finishing of parts in the engineering industries such as cylinder bores, pistons, tools, etc. In the case of decorative buffing and coloring, one has hardly proceeded from the stage of hand polishing and the dependance on the skill of the operative, i.e. the processing has remained a craft and is more or less entirely dependent on the personal element, is somewhat slow and laborious and so relatively costly. The object of the polishing is to obtain a smooth, brilliant and pore free surface. In the case of plated tableware as an example of ware produced in large quantities, the surface to be polished is often ornamental and embossed; the plating must not be pierced through the embossing and, even when the surface is not embossed, the nature of these articles provides a complicated shape which renders the polishing a difficult procedure. Then again, the various parts handled by the tableware industry vary considerably, not only in shape but in size. Accordingly, in the tableware industry, the buffing and polishing costs are excessively high for this reason. It has not been possible to design any automatic polishing machine which can handle this class of ware although attempts in this direction have been made. Obviously, development in this direction must come by way of developing an entirely new polishing process.

Study in this direction was first to analyze the various stages of hand polishing. The analysis showed that the polisher first places the polishing medium on the wheel. The wheel then applies the polishing particle in rapid motion against the article. If, accordingly, one wishes to make automatic the hand polishing procedure, the polishing medium must be led tangentially to the article being buffed or polished. This was first tested on tableware by hydraulic means. In these tests, spoons were placed on the underside of an embossing die and the polishing paste was passed at about 5 atmospheres pressure through an opening in the upper half of the embossing die. A certain buffing effect was obtained which, however, was also exercised on the pipes and walls of the die. In addition, the material

removal with this Hydra polishing process, was too small. This way was, accordingly, not feasible.

A return was then made to loose grinding particles, as is used in decorative hand polishing. A directed buffing and polishing effect could be achieved in this manner and also the damaging effect on the equipment avoided. The fundamental principle of the full-automatic "immersion" buffing and polishing machine thus developed, is that the loose abrasive particles in the machine form a continuous buffing or polishing area ring inside the machine, by means of the impelling force of the centrifugal unit incorporated. This abrasive ring is flexible and is controlled according to the rotational speed. The ring diameter also plays a role. The abrasive medium flows like an air current around the objects to be buffed or polished and eddies behind each particular part. After tests with a small centrifuging unit, a large machine on this principle was built, incorporating full automatic operation, charging and discharging. The operating principle of the machine is as follows: The operator stands at the loading station of the machine and places the parts, one by one, on to the receiving position, from where they are automatically transferred to the swinging arm. This arm then immerses the part in the abrasive buffing or polishing ring flow set up by the centrifuge and, after the set buffing or polishing time has elapsed, the part is again returned automatically to the loading station for discharge. A centralized drive operates simultaneously 12 swinging arm pairs and thus 24 parts. In operation, the swinging arms turn the parts over around 270 degrees so that the polishing is effected on all sides. Each swinging arm pair is provided with a special motor for this purpose. The duration of the polishing is regulated by hand as desired from 2 to 14 machine revolutions. One revolution of the part round the machine lasts 7 seconds and the longest polishing time is accordingly 98 seconds. A certain masking effect behind prominences on the part will occur so that interruption of the turning-over motion at a determined position will serve to overcome this. A regulating device allows the turning-over motor to stop at this desired location, by means of a time relay. After from one to five seconds has elapsed the motor is automatically switched on again. The abrasive buffing and polishing medium for brass and nickel silver is a mixture of pumice, wood flour and oil and, for steel and stainless steel, a mixture of emery, wood flour and oil. The polishing costs are a tenth of normal practice. The machine must be of robust construction; minor practical details still remain to be solved.

High Purity Aluminum-Magnesium Alloys for Bright Anodic Treatments

J. Herenguel; *La Metallurgia Italiana*, vol. 43, p. 72.

The conditions are outlined to achieve brilliant surfaces with the anodic processing of aluminum-magnesium alloys: absence of single phases and macroscopic liquation in the magnesium content of solid solutions; fine alloy grain size: absence of dominant textures and choice of oxidation conditions which do not favor the anisotropy in the growth speed of the aluminum oxide layer.

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Test for Chromate Films

Question: Please advise if you are familiar with a qualitative test for the presence of chromate films on bright-dipped, zinc plated work. We would appreciate your forwarding instructions for such a test as soon as possible.

R. N. O.

Answer: The following solution has been employed as a spot test for chromate conversion films:

Water	40 ml.
Acetic acid	60 ml.
Diphenylcarbazide	1 g.
Wetting agent	0.1 g.
Hydrochloric acid	15 ml.
10-15% sodium hypochlorite soln ..	30 ml.
100 vol. hydrogen peroxide	5 ml.

Add in the above order and age 24 hours. A drop applied to the surface will turn red or purple in 1 minute if a chromate film is present.

Again — Spotting Out

Question: I would appreciate any help you can give on a spotting out problem I'm having on porous steel welds on steel frames, and also porous bronze castings. We are getting brown spots on the finished work. A cyanide solution is used for a finish coat, such as brass plate, bronze plate or statuary finished castings or welded steel parts. Can you give some information on neutralizing the cyanide to prevent this. I do not have a steam plant, but a hot water heat system, therefore my hot rinse tanks are at top temperature of about 190° to 200° F.

I have been using dilute sulphuric acid as a cyanide neutralizer and, after rinsing, reverse current in my cleaner tank to neutralize the acid again. Then hot rinse and blow off with air. This

method helps, but does not entirely eliminate my problem.

H. R. H.

Answer: The best method we have found to minimize spotting out is to bake before lacquering. Use a gas or electrically heated oven at temperature of about 230 deg. F. for ½ hour. Higher temperature will result in tarnishing of the brass or copper finish. After baking, allow to cool and lacquer immediately.

The sulfuric acid dip as a neutralizer is good practice since the alkalies in the pores will affect lacquer adhesion. For the same reason we would not go back into the cleaner to neutralize any acid in the pores. Besides, if your cleaner is silicated, you might get a precipitate of silicic acid which would be a cause of spotting out.

Immersion Tinning

Question: We are desirous of obtaining further information regarding process of 'Immersion Tinning' of steel. Some details of this was contained in an article on page 95 of your September 1951 issue. If this process has since been patented please state if a copy of this patent could be made available to us.

It is also requested that a copy of the Technical Instruction Manual giving details of the Cadux HS process for rust proofing iron and steel may also be forwarded to us.

B. P. C. B.

Answer: The immersion tinning process referred to has been patented. Copies of the patent may be obtained at 25c each from the Commissioner of Patents, Washington 25, D. C. Just ask for U. S. Patent # 2,543,365.

The Cadux HS process is a bright cadmium solution marketed by Han-

son-Van Winkle-Munning Co., Matawan, N. J. It is suggested that you write to them for their instruction manual.

Staining of Brass Deposit

Question: Taking advantage of your skill in solving problems, we would like to ask you the reason for the bad appearance of the articles enclosed. They are brass plated on steel. The same thing happens to all the articles put into our bath.

We have a 200 gal. tank with 2 Lucite barrels and use the standard bath for brass. The articles are fine while they are in the barrels and being plated but once they leave the bath they take on these marks as if it were caused by the liquid of the bath. We filter the bath but it does not do away with the marks although the dirt in the bath seems to accumulate very rapidly. The pH is 11, we use from 7 to 9 volts for the 2 barrels. The rinse water is in tanks painted with lead paint to prevent rusting.

L. F. Z.

Answer: The stains on your sample are due to the steel tarnishing through the brass deposit. Immersion of the plated sample in acidified copper sulfate solution resulted in a copper deposit, indicating that the brass plate is too thin.

The lack of brass plate at 7 to 9 volts, together with the very poor off-color of the deposit indicates that the solution may have been prepared as a standard brass bath but is not in that condition now. We would suggest that you have the solution analyzed.

Precipitating Carbonates

Question: Last winter when our sodium cyanide plating solution built up with too much carbonate we were able to bring it down very good by freezing it outdoors in containers. It worked fine.

We now have the same condition again and wonder if you know of a practical way aside from freezing to bring down the carbonate content. The

anodes are clean and white but the solution plates dull and rough.

E. M.

Answer: There are two practical ways to remove carbonate from cyanide solutions besides freezing out.

The carbonates can be precipitated by adding lime in the amount of 1 oz. for each 2 oz. of sodium carbonate. The end products are calcium carbonate precipitate and caustic soda.

If the carbonates are very high, the use of lime will result in an excessive caustic soda content, in which case powdered, purified gypsum could be employed in the amount of 1.6 oz. for each ounce of sodium carbonate. The end product in this case, in addition to the calcium carbonate precipitate, is sodium sulfate which does not interfere.

Fusing Electrotin Deposits

Question: The "Shop Problems" section of your publication is most interesting and informative. I hope that the technical knowledge available to you for this section will enable you to supply me with the answer to a problem I am submitting.

Our firm is tin plating drawn cans of cold rolled steel for use by the electronics industry. Approximate size is 2 inches square x 3 inches deep. However, due to the fact that the flash point of our fusing oil is in the very close

neighborhood of the fusing temperature our fusing process poses a definite problem because of the danger involved.

J. C. R.

Answer: In order to prevent your fusing oil from flashing, it is necessary to keep all sources of flame away from the tank.

Common practice is to hang a door over the tank held open by a fusible link. This is made part of the exhaust system which, incidentally, is a necessary part of the installation to prevent the oil fumes from accumulating over the tank.

You do not state the method of heating but, if you are using gas or oil, you should consider electric heat. The heat capacity of fusing oils such as palm oil or tallow is much lower than that of water so that a very large heater would not be necessary.

Thin Deposit on Rough Surface

Question: We have difficulty in plating brass on zinc die castings which are prepared with 120 emery. It is this surface which the plating has to cover. After plating for an hour the brass is very thin, as compared to a smoother surface.

How can I overcome the apparent polarization without changing the undersurface (the 120 emery)? In your

opinion, to what extent would this rough surface increase the low cathode efficiency that brass usually has?

I would also like your recommendation on the type of basket (metal) to use in the oxidizing of brass plated zinc die castings. We have used Monel, stainless, and aluminum, and find the former two make the work too dark where in contact, and aluminum retards the oxidation where in contact. Scrambling the work does not help sufficiently.

Your opinions will be appreciated.

I. T.

Answer: The plating on a surface finished with 120 emery would be much thinner than that deposited on a polished surface, since there is much more surface to cover, possibly double. It should be remembered that the groove produced by the grain of emery has two sides if triangular and a given weight of brass deposit must, therefore, be thinner on such a surface.

This is not a case of polarization or decrease in cathode efficiency and the remedy is to increase the current to allow for the greater surface area to be plated.

To avoid the electrolytic action between the plated zinc and a metal basket, use a rubber or plastic coated wire basket or a ceramic basket for oxidizing.

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Strip Plating Machine

U. S. Patent 2,610,146. Sept. 9, 1952.
W. W. Kompart, assignor to National Steel Corp.

Apparatus for continuously electroplating the bottom surface of a moving strip of conductive material with a layer of protective metal comprising a horizontally disposed tray presenting an electroplating cell adapted to have the strip move along a path across the cell from end to end with the bottom surface in contact with electroplating solution in the cell, an anode support in the cell in position to be submerged in the electroplating solution below the bottom surface of the strip, the anode support including a member of molded carbon resistant to attack by the electroplating solution, the member of molded carbon having a base portion and a guide portion extending along the base portion and extending upwardly from the base portion, the base portion presenting surfaces exposed to the electroplating solution extending across the path of the strip and along opposite sides of the guide portion, a series of soluble anode elements of protective metal slidably mounted on and in electrical contact with each of the exposed inclined surfaces, each of the series of anode elements being slidable along and up the respective inclined surfaces while maintaining electrical contact therewith, the carbon member including an extension portion extending upwardly from an end of the base portion and extending above the electroplating solution and the path of the strip, and electrically conductive metal embedded in the carbon member, the metal including a first portion embedded in the base portion extending along and below the inclined surfaces for supplying electrical current to the surfaces and to the anode elements positioned on the surfaces and including a second portion embedded in the extension portion of the carbon member and extending upwardly outside of the extension portion of the carbon member for connection to a source of electroplating

current, and a protective covering on the base portion preventing electrical contact of the electroplating solution with the surfaces of the base portion exposed to the electroplating solution with the surfaces of the base portion exposed to the electroplating solution except the inclined surfaces which are in electrical contact with the anode elements.

Strip Plating Machine

U. S. Patent 2,610,145. Sept. 9, 1952.
A. B. Wilson, assignor to National Steel Corp.

Apparatus for continuously electroplating a moving strip of material having a conductive surface in which a tray presents an electroplating cell adapted to have the strip move across the cell from end to end in a horizontal path with the conductive surface thereof in contact with the electrolyte in the cell comprising an anode-supporting structure in the tray below the path of the strip, the anode-supporting structure including a supporting base member of electrically conductive, corrodible metal extending across the tray and the path of the strip and having an upper surface extending across from side to side of the path of the strip, means for connecting the base member to a source of electroplating current, a member supported by the base member and formed of carbon resistant to attack by the electrolyte and disposed below the path of the strip in the electrolyte of the cell in electrical engagement with the upper surface of the supporting base member along the length of the carbon member, the carbon member presenting an upper surface facing toward and extending across from side to side of the path of the strip and the conductive surface of the strip, and a protective coating on the surfaces of the base member and the carbon member exposed to the electrolyte to prevent the electrolyte from chemically acting on the same, except the upper surface of the carbon member which is left exposed, and a plurality of soluble, electroplating anode elements submerged in the electrolyte and

supported by the anode-supporting structure in electrolytic relationship with the conductive face of the strip, the anode elements being slidably mounted on and in direct electrical contact with the exposed upper surface of the carbon member.

Periodic Reverse

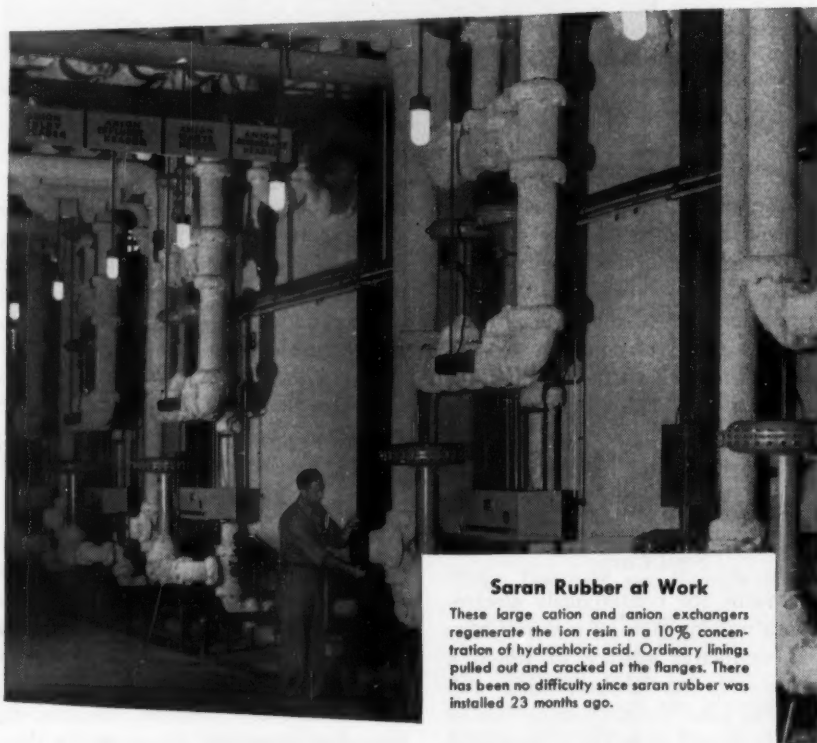
Patent Application 105,447. Oct. 14, 1952. R. W. Mackey and D. A. Swalheim

This application relates to periodic current reversal electroplating in which an article to be electroplated is rendered cathodic during a major portion of a plating cycle and anodic for a minor portion thereof.

The invention resides, broadly, in use of a somewhat longer cycle than has heretofore been considered practicable. The article to be plated is held cathodic for 50-120 seconds and anodic for a limited fraction, 5 to 75%, of the cathodic time. By use of such a cycle a plate can be obtained on irregularly shaped articles largely free of the haze or bloom that frequently mars the low current density areas of such plate. The preferred plating cycle consists of a cathodic time of 50-80 seconds and an anodic time of 15-30 seconds.

In a specific example of the present process copper was plated on steel at a constant over-all current density of 50 amps./ft.² from a conventional copper cyanide plating solution to yield a deposit about 0.001 inch thick. The current density varied over the surface of the article plated because of the configuration of the article and that of the cell. A cycle in which the steel was cathodic for 10 seconds and anodic for 3 gave a product showing considerable haze or bloom in low current density areas. A cycle with a cathodic time of 50-100 seconds followed by an anodic period of 15-30 seconds largely eliminated the haze. The cycle with the longest periods however gave slight burning in high current density areas not evident when shorter periods were utilized.

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Black on Magnesium

U. S. Patent 2,613,165. Oct. 7, 1952.
E. F. Fischer, assignor to Aluminum Co. of America

In the process of applying a black color to magnesium base alloy die castings, the steps comprising immersing said castings for a period of $\frac{1}{4}$ to 5 minutes in an aqueous solution having as essential components thereof for producing a bright finish on said castings, prior to the application of the black color, 0.75 to 12% by weight of nitric acid, 5 to 60% by weight of chromic acid and 0.01 to 2% by weight of hydrofluoric acid, the ratio of nitric acid with respect to chromic acid being such that the weight of nitric acid is between 1.25 and 75% of the weight of chromic acid, said ratio diminishing as the chromic acid content increases beyond the point where the minimum amount of chromic acid can be used with the maximum amount of nitric acid so that at a concentration of 50% and more of chromic acid the nitric acid does not exceed 3% by weight and the hydrofluoric acid does not exceed 0.2% by weight of the solution, said solution being maintained at a temperature between 85 and 100°F., withdrawing said castings from said solution, rinsing them, immersing them for a period of $\frac{1}{2}$ to 2 minutes in a second aqueous solution containing from 1 to 20% by weight of an alkali metal hydroxide maintained at a temperature between 180°F. and the boiling point of said solution, withdrawing said castings from said second solution, rinsing them and thereafter immersing them in a third aqueous solution containing potassium chrome alum and sodium dichromate as the essential components to produce a black color on said castings.

Tank and Spray Unit for Cleansing

U. S. Patent 2,614,571. Oct. 21, 1952.
A. J. Turpin, assignor to Hauck Mfg. Company

The combination with a cleansing tank comprising bottom, front and rear, and side walls to afford an open container for a cleansing liquid; a lid member for the tank hinged at the rear wall, and end wing members secured to opposite ends of the lid member to fold thereunder, together with manually operable latching elements to attach the wing members to the under

face of the lid member when the latter closes the tank and adapted for release of the wing members when the lid is in elevated position, said wing members being adapted then to be extended outwardly therefrom substantially into the respective planes of the side walls to provide with the lid member a spray shield; of a spray unit, having means for removably supporting the same over the upper edge of the front wall of the tank, whereby to cleanse an article elevated out of the interior of said tank and suspended in the space above the same and within the partial enclosure defined by said shield, which latter confines substantially within the said space spray from the spray unit directed to said elevated article.

Process for Making Colored Aluminum

U. S. Patent 2,614,912. Oct. 21, 1952.
C. M. Rice, assignor to Sinclair & Valentine Co.

The method of decorating anodized aluminum sheet material which comprises printing on the anodized surface of the aluminum a design in an ink comprising a dye dissolved in a film-forming ink vehicle, dyeing the unprinted portions of the surface by immersing the surface in a dye solution which does not dissolve the ink vehicle, sealing the surface by treatment with boiling water and dissolving away the remaining ink vehicle.

Bright Dip for Aluminum

U. S. Patent 2,614,913. Oct. 21, 1952.
H. J. Reindle and S. R. Prance, assignors to General Motors Corp.

A brightening bath for use in connection with aluminum and/or aluminum alloys wherein the brightening is carried out at a temperature varying between 185°F. to 212°F. consisting of; a solution having as its basic ingredients ammonium bifluoride .30% to .75%, nitric acid 2.0% to 7.5%, chromic acid .30% to .75% and ethylene glycol .40% to 1.0% and wherein water makes up substantially the remainder of the bath.

Bright Acid Zinc Bath

U. S. Patent 2,164,975. Oct. 21, 1952.
A. E. Chester, assignor to Poor & Co.

An aqueous acid zinc sulfate plating bath comprising an acid zinc sulfate electrolyte and a reaction product of thiourea, zinc oxide and an aldonic acid.

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Corrosion Inhibiting Composition

U. S. Patent 2,615,815. Oct. 28, 1952.
G. D. Galvin and A. E. McAulay, assignors to Shell Development Co.

A composition for displacing moisture and preventing corrosion of metals having the following formula and proportions by weight:

	Per cent
Limed petroleum residue rich in natural cyclic acids	20
Lanolin	10
Sodium salt of oil-soluble petroleum sulfonic acid derived from raffinate fraction of a solvent-treated oil	3
Zinc naphthenate	5
Diacetone alcohol	2
White spirits	Balance

Electrolytic Method to Remove Rust

U. S. Patent 2,615,840. Oct. 28, 1952.
A. A. G. Chapman.

A method of freeing metals from rust, corrosion and the like which comprises immersing a metal article in an electrolytic bath and passing an electric current between an anode in the bath and the article as a cathode, said bath consisting essentially of an aqueous solution of the following compounds:

Alkali metal hydroxide	2 to 3 1/2 lbs./gal.
Alkali metal cyanide	2 to 4 oz./gal.
Alkali metal chloride	1 to 8 oz./gal.
Alkali metal fluoride	1/4 to 2 oz./gal.
Wetting agent	1/16 to 1/4 oz./gal.

and a member of the class consisting of alkali metal metasilicate and aluminate, 2 to 4 oz./gal.

Washing Composition

U. S. Patent 2,615,846. Oct. 28, 1952.
V. Dvorkovitz and T. G. Hawley, Jr., assignors to The Diversey Corp.

In the washing of glassware, metal, rubber and the like with water containing dissolved calcium and magnesium salts with highly caustic solutions, the method of preventing deposit of unsightly films on the articles being washed which comprises adding to the hard water about 0.25-20% by weight of caustic alkali and about 0.025-2% by weight of alkali metal gluconate,

the additions being free from ions capable of precipitating substantial amounts of calcium and magnesium salts in the presence of alkali metal gluconate whereby the alkali metal gluconate substantially inhibits precipitation of the calcium and magnesium salts of the hard water.

Metal Coloring

U. S. Patent 2,616,841. Nov. 4, 1952.
J. E. Stareck, assignor to Kansas City Testing Lab.

An improved bath solution for electrolytically reducing cuprous oxide to produce patterns or designs, consisting essentially of 7.5 g./l. to 60 g./l. sodium hydroxide and 0.2 g./l. to 5 g./l. ammonia in aqueous solution.

Rhenium Plating

U. S. Patent 2,616,840. Nov. 4, 1952.
R. Levi, assignor to Philips Laboratories, Inc.

A method of forming on a base of refractory metal a covering of substantial thickness of pure stable rhenium in crystalline form having an X-ray diffraction pattern containing all of the characteristic lines of crystalline rhenium which comprises the steps of electro-depositing on the base a thin layer of amorphous rhenium, transforming the amorphous rhenium layer into a layer of crystalline rhenium by heating the same in a reducing atmosphere at a temperature at which the rhenium crystallizes without melting, and successively repeating the steps until a coating of crystalline rhenium of substantial thickness is obtained.

Electrolytic Polishing Apparatus

U. S. Patent 2,616,845. Nov. 4, 1952.
J. F. Kreml, assignor to Armco Steel Corp.

Electrolytic polishing apparatus for toploading comprising, in combination, flat anode means for supporting a batch of products to be polished and having openings therein smaller than the individual products, cooperating flat open mesh cathode means above the anode and having openings therein of sufficient size to admit the products to the anode when charged onto the cathode, electrical insulating spacers fixedly secured to said anode and to said cathode and maintaining said open mesh cathode at effective electrolytic polishing solution, a container therefor, and means supporting said anode and cathode in substantially horizontal position in said solution.



Specialists in Industrial Cleaning Products



Paint does not chip or crack on PRE-FOS treated steel.

"SUPERB PAINT ADHESION after cleaning and phosphating with WYANDOTTE PRE-FOS"

says Mr. S. L. Wigodner (right) of L. J. Segil Co.

HAVING trouble with paint adhesion? Then read the report of Mr. S. L. Wigodner, purchasing agent of the L. J. Segil Co., Chicago lighting-fixture manufacturers:

"We can repeatedly bend pieces of steel, which have been treated with PRE-Fos* and then painted, without breaking the paint film loose. We are very pleased with the results of using PRE-Fos.

"Previously, we had tried most of the other available phosphating cleaners with indifferent success. Not only has PRE-Fos given us superb paint adhesion, but also excellent cleaning and corrosion protection. We have found PRE-Fos economical and the solution easy

to maintain and control."

Versatile

Wyandotte PRE-Fos performs well in hard or soft water, in spray washer or soak tank. It has long solution life, rinses freely and completely, prevents rust of steel parts in process, and prepares metals for paint.

If you're painting metals, investigate PRE-Fos. Also ask your Wyandotte representative about our full line of products for better metal cleaning. *Wyandotte Chemicals Corporation, Wyandotte, Michigan; also Los Angeles 12, Calif.*



* Reg. U.S. Pat. Off.

Largest manufacturers of specialized cleaning products for business and industry



Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the United States and Canada

Recent Developments

New Methods, Materials and Equipment
for the Metal Finishing Industries

Buffing and Polishing Greaseless Composition

Hanson-Van Winkle-Munning Co.,
Dept. MF, Ma'awan, N. J.



A new buffing and polishing composition known as "Acme Greaseless Composition" is announced by the above company. The new composition adheres strongly to the wheel face to form a heavy, fast drying "head" which does not fly off and remains firm even in the warmest weather. There is no waiting for an application to set.

The composition also features a consistently-sized abrasive. Particles of exactly the same size act upon all parts of the work to produce a uniform finish. The new product may be used on brushes and buffing wheels and for hand buffing. It gives excellent results in cutting, polishing, deburring or satin finishing all metals and is available in aluminum tubes and in foil-lined cardboard cartons.

For further information on this and other buffing and polishing compositions write to the above company and ask for Bulletin C-100.

Ultrasonic Degreaser

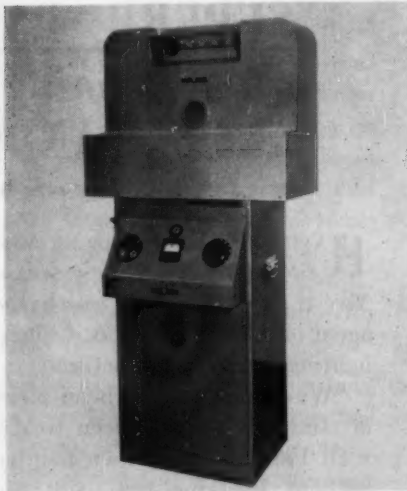
Topper Equipment Co., Dept. MF,
Clark Township (Rahway), N. J.

A completely new method for fast,

efficient degreasing of metal parts has been announced.

The new Circosonic cleaning machine uses ultrasonic waves to clean metal parts. It removes oil, grease, chips, dirt, lapping compound and many other contaminants from the surface of small precision work pieces at a rate hitherto unobtainable and to a degree of cleanliness that passes the most stringent industrial standards.

The heart of this degreaser is the ultrasonic generator developed and manufactured by the General Electric Co. and is used in conjunction with specially developed Circo vapor degreasing equipment and technique.



The ultrasonic generator converts high frequency electrical energy into high frequency mechanical vibration by means of a quartz crystal. This energy is transmitted up through the cleaning tank. The region above the crystal is greatly agitated, accelerating the normal cleaning action. It is in this zone that the cleaning is accomplished. After the ultrasonic cleaning action takes place, the parts are rinsed by fresh, clean fluid and quickly dried by the vapor process, emerging sparkling clean.

The equipment built around the ultrasonic generator is available in either the continuous production or

batch type methods. Circosonic cleaning is claimed to be especially effective where a high quality product is desired free from all contamination and wherever complex shapes exist such as corners, cracks and holes.

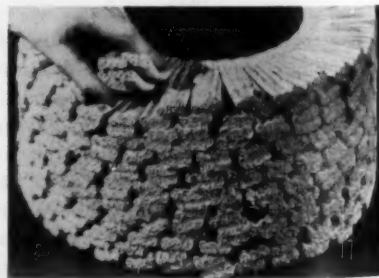
New Type Sisal Buff

Geo. R. Churchill Co., Inc., Dept. MF, 7518 Fayette St., North Quincy 71, Mass.

This manufacturer announces a new type sisal buff of finger-type design which he claims to be entirely new to the polishing and buffing operation. It is called the "20-RD Sisal Buff."

As may be seen from the illustration, each "finger" of this new sisal buff is extremely flexible. Thus the entire buff is truly flexible, a feature that the manufacturer claims to be unique to sisal buffs and makes it particularly adaptable for work involving curved surfaces and recesses.

A second entirely new feature of this buff, is the manner in which the sisal itself is manufactured into the buff. Only a specially processed, tightly twisted, first quality sisal twine is used. This is fabricated into each buff finger in such a manner that only the raw ends of the sisal fibres are in contact with the work. Hence cutting compounds are readily picked up



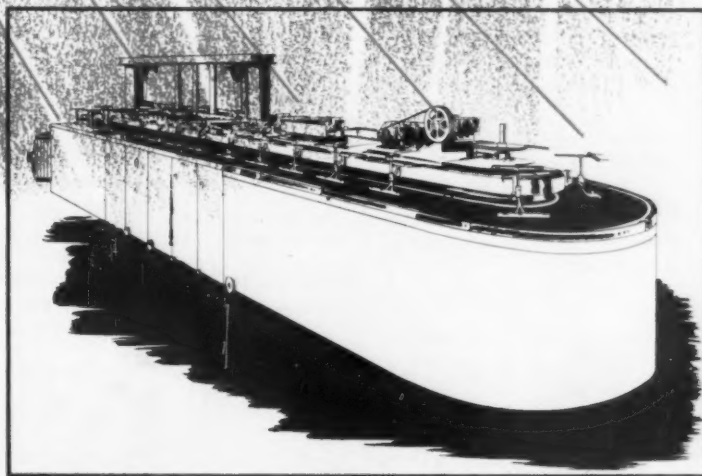
and held, and the tough part of the sisal is the only part of the fibre that is actually doing the cutting. The advantages of this construction are much faster cutting action and longer wear qualities.

Offered at the same cost as the regular line of Churchill Finger Buffs, this entirely new 20-RD Sisal Buff is pro-

LEA

and
Ronal

...two pioneering names, each responsible for major contributions in the field of electrodeposition, electroplating and finishing, now identified with three important developments worked out jointly by their respective technical staffs.



LEA is the name by which our company is widely known throughout industry whenever plating, abrading and other allied problems are discussed, for it is in this field that we have specialized for some thirty years. From our research and development laboratory have come many important products and methods, which have resulted in greatly improved plating and finishing operations and lower costs.

RONAL is the name by which a leading company in its field is known... a company long specializing in the development of new and unique processes in electrochemical deposition. This company is Ronal Chemicals, Inc., Long Island City, New York.

It was only natural that with Lea's leadership in electrochemical, electroplating and allied fields it should collaborate with Ronal. Lea has joined its research and development organization and its contacts with industry with the scientific 'know-how' of Ronal Chemicals, Inc., from whose laboratory

have already come three significant developments in electrodeposition: Ronal Bright Copper, Ronal Bright Silver, and Ronal Bright Gold. These are now being merchandized respectively under the names of Lea Copper Glo, Lea Silver Glo and Lea Golden Glo.

Watch for further developments. Meanwhile if either we or Ronal can be of help in any research or pilot plant studies you are making, do not hesitate to call on us. If your responsibilities cover plating and finishing—and you're not satisfied with the results—perhaps we can help in this, too.



Burring, Buffing, Polishing, Plating and Spray Coating... Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions.
Manufacturers of Lea Compound and Learok... Industry's quality buffing compounds for over twenty-five years

THE LEA MANUFACTURING CO.

16 Cherry Avenue, Waterbury 20, Conn.

LEA MFG. COMPANY OF CANADA, LTD.

370 Victoria Street, Toronto 2, Canada

PRECLEAN the Dip-Rinse Way!

WHY PRECLEAN?

Even if you do not finish work by plating or vitreous enameling, it is important that you get a metal surface free of solid dirt as well as oil and grease. Subsequent metal forming operations... final painting and other finishes... require a physically clean surface for efficient operations. In such cases, precleaning by the Magnus Emulso-Dip Method becomes the one and final cleaning operation. If you plate or enamel your work, precleaning by this method vastly improves the speed and quality of your final cleaning operation for a chemically clean surface. The Emulso-Dip Method removes dirt which resist virtually all other methods of cleaning.

There is a simple, sure-fire way to get physically clean metal surfaces... ANY metal surfaces... ready for subsequent metal-working operations, painting or final cleaning before plating. It is as simple as the words "dip-rinse" indicate.

Remove ALL the Dirt... Solid as well as Soluble Oil and Grease

It's the Magnus Emulso-Dip Method. Work to be precleaned is dipped into (or sprayed with) a solution made up of one part Magnusol concentrate with four to eight parts petroleum solvent. This solution rapidly wets and penetrates dirt deposits, loosening the bond between all dirt elements and the metal. Then the work is flushed off with water, steam or safety solvent. Oil and grease AND solid dirt—chips, abrasives and other insoluble matter—are flushed away, leaving completely physically clean metal surfaces.

Safe... Sure... and VERY Economical

The Magnusol cleaning solution is non-toxic, non-flammable, harmless to the skin and safe for ALL metals. Above all, it provides thorough cleaning at the lowest possible cost... in materials as well as man-power.

Ask for a demonstration... either in your own plant or in the Magnus Pilot Laboratory.

MAGNUS CHEMICAL CO., 11 South Ave., Garwood, N. J.
In Canada — Magnus Chemicals, Ltd., Montreal.
Service representatives in principal cities.



MAGNUS

CLEANERS • EQUIPMENT • METHODS

duced in all sizes from 6" to 18" diameters, for both hand buffing and automatic machines.

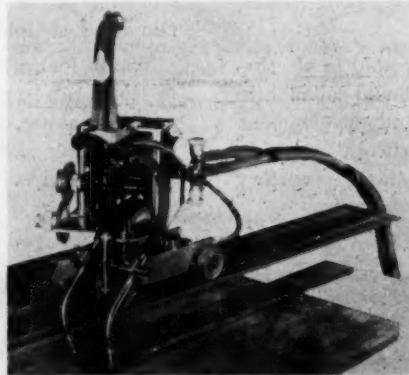
For further information write to the above address.

Automatic Lead Cladding Steel on Copper

Knapp Mills, Inc., Dept. MF, Brooklyn, N. Y.

This firm has announced an entirely new and highly versatile automatic machine which will produce a perfect chemical bond between lead and steel. In one day one machine will clad a steel surface that would require 8 to 10 man-days to cover by out-moded hand techniques, according to the company. It will chemically bond a strip of lead up to 12" wide by 1/4" thick to prepared steel. The operator

can control the width and thickness of the lead cladding by regulating the speed of the machine and by spread-



This view discloses that the machine may operate on a track placed on top of the steel which is to be clad, and that it will clad lead to either the right or left side of the track. Note the bar of lead directly under the cladding head.

ing or narrowing the two cladding heads with which it is equipped.

An important advance in design over earlier models makes it unnecessary for the machine to carry its own lead supply. A strip of lead is laid down under the machine; the cladding heads melt this lead and chemically bond it to the steel as the machine automatically moves across the plate. The machine is so designed that it may also carry its own lead supply in tubular feeds at the front of the unit. While the machine may run free, directly on the steel, it will also operate on a track. By taking off the bottom carriage, reversing it, and mounting it on the top of the machine, the unit will run on a light-weight aluminum or magnesium beam so it operates in a tank shell as well.

The whole carriage may be turned to clad lead on either the right or the left side. With all of its versatility and many functions, the unit illustrated weighs less than 15 pounds. Even though the cladding heads direct intense heat on the lead and steel beneath them, the machine itself does not even become warm in operation.

A hand-operated model has also been designed. This hand tool may be used to burn lead to lead as in welding sheet lead and pipe. The hand unit, weighing less than 10 pounds, operates without a carriage on a single wheel or tripod arrangement with a grip for the operator.

The company is also investigating other combinations of metal, since the cladding machines appear to be suitable for combining metals other than lead with steel. For example, tin clad steel may be produced through their employment.

Aluminum Deoxidizing Process

Northwest Chemical Co., Dept. MF, 9310 Roselawn, Detroit, Mich.

A new process, used in preparing aluminum surfaces for welding, has been announced. According to Northwest's president, H. J. McCracken, the new Alkalume process thoroughly removes all soils and oxides without harming metal, thereby reducing surface resistance to a value of 0 to 10 microhms. He also states that a resistance of 10 to 20 microhms will persist for many days without reoxidation.

In addition to eliminating mechanical cleaning operations such as the

use of rotary wire brushes, the new method assures more perfectly formed welds, free from cracks at a worthwhile saving in time and cost.

Laboratory tests, made on various alloys and gauges of metal definitely indicate that the process allows for production welds meeting specified values for penetration and shear strength. Welds also average well above allowable deviation in shear strength. Tests indicate conclusively that more welds are possible between tip dressings, and at lower pressures. Graphs illustrating performance curves, for various alloys, are now being made available.

New Ventilated Buff

The Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

The above company announces a new self-ventilating buff which enables faster buffing and reduces buff wear. The new buff, known as Ruff-L-Buff, may be used for hand or machine operation.

When two or more are combined to make up a buffing wheel, ventilating air enters the wheel through holes in the fibre-board centers of the buffs. As the wheel rotates, centrifugal force drives the air through twelve channels between each buff to the cloth portions of the buff where numerous ruffles distribute the air over the buff side and channel it on through the wheel, cooling as it goes.

This makes it possible to operate wheels at higher speeds and to apply greater pressure between the work and the wheel. The net result is faster buffing with less buff wear. The ventilating feature also results in the use of less buffing composition as the composition binder is not volatilized through excessive heat.

Cloth used in making the buffs is cut diagonally to the threads. This "bias construction" exposes to the work the maximum number of thread ends, thus getting more cutting action per revolution. Since cloth cut on the bias does not ravel, buffs wear longer, and also, there is less lint, which means that less buffing composition is wasted since less of it is discarded with lint.

Other features of the buff are: perfect balance for uniform rotation and wear, steel-ring anchor to secure the cloth to the fibre-board center, and exclusive Red-E-To-Use face which takes composition immediately with-

Chromic acid purified and reclaimed by **ionXchange**

PURE CHROMIC ACID can be recovered from your anodizing baths . . . plating and rinse water can be reclaimed and recirculated . . . easily, economically . . . with this newest ILLCO-WAY development. Standard and portable models.

Portable unit

. . . for treatment of several solutions located throughout plant; easily stored. Four standard sizes.

To provide pure water for make-up . . . a complete line of

"PACKAGE" DE-IONIZERS

. . . standard units for producing solids-free De-ionized water. (With a Chrome Purifier, tanks are never dumped, so pure water is more important than ever.)

Write for literature: Illinois Water Treatment Co., 856 Cedar St., Rockford, Illinois.



ILLCO-WAY



out the necessity of evening the buff surface and impregnating it with composition.

Ruff-L-Buffs are available in standard and heavy duty weights with outside diameters of 12, 14, 16 and 18". Non-standard sizes on request.

For further information write to the company, and ask for Bulletin B-100.

Wire Stacking Box

Equipment Manufacturing, Inc., Dept. MF, 21550 Hoover Road, Detroit 5, Mich.

A new stacking type material handling box is announced by the above firm. The new box, instead of using corrugated sheet metal has sides and bottom of wire fabric to decrease

Behind the 8 Ball with Your Anodes?

HERE ARE TWO
PRACTICAL SUGGESTIONS
DESIGNED TO HELP YOU!

1 CONVERSION OF SCRAP NICKEL TO NEW ANODES

New Jersey Metals can help you stretch your present nickel supply by melting and recasting your grade "A" nickel scrap, anode ends and stubs into new nickel anodes. Complete anode conversion—including cutting and finishing—is completed in a matter of days. What's more you actually save 5 to 10 cents per pound over the purchase of new anodes. The purity content of the new anodes returned to you is guaranteed. Quotations on any quantities—laboratory analysis is free.

2 ZINC BALL ANODES

Here's the newest addition to the New Jersey Metals line. Manufactured of the highest grade zinc, New Jersey Metals zinc ball anodes are guaranteed to be 99.99+% pure virgin zinc. Designed in the most efficient shape, these anodes provide the greatest plating surface per pound of any anode. Easier to handle, they facilitate faster production and can be used with either ball holder or anode basket.

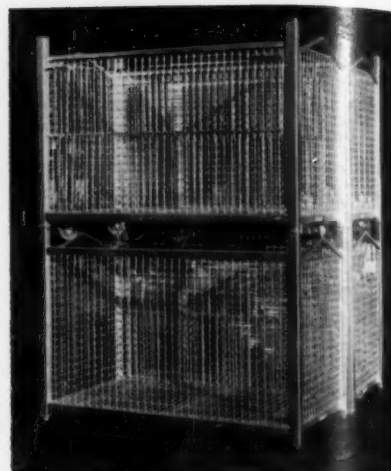
Furthermore, you're buying all metal—no dross as hidden losses or blow holes to carry contaminating matter to your plating solution.

Whether it's converted nickel anodes or pure zinc ball anodes, it will pay you to look to New Jersey Metals for your anode requirements. Call Elizabeth 2-6465 or write . . .

New Jersey Metals Co.

Serving industry from coast to coast since 1921

714 ROCKEFELLER ST., ELIZABETH 2, N. J. 



weight and allow for ventilation and drainage. The wire is welded at ends and each intersection for strength and rugged shop use. Bottom frame and corner uprights are square welded steel tube.

Stacking caps of the self-centering type on the corner posts permit rapid and safe lift truck tiering to conserve floor space.

The standard model shown has a content of approximately 30 cubic feet and a weight capacity of 4,000 pounds.

The box is available in various meshes and sizes according to load requirements and can be provided with lifting hooks for crane handling. Aluminum paint finish is standard.

Twin-Tunnel Metal Washing Machine

Cincinnati Cleaning & Finishing Machinery Co., Dept. MF, Schmidt Bldg., Cincinnati 2, O.

A new metal cleaning machine, featuring a two-in-one space saving design, has been announced by this firm. Recently installed by a division of a leading refrigeration manufacturer, it processes both monorail conveyor and belt conveyor production.

Large parts not carried on the conveyor belt section of the washer and manually unloaded at the discharge end. Smaller parts, fragile or difficult to clean, can be processed on the belt, using baskets or racks.

Waterless Hand Cleaner

Magnus Chemical Co., Inc., Dept. MF, Garwood, N. J.

The above company announces the marketing of their Waterless Hand Cleaner. While primarily for use where water is not convenient or available,

this product is water soluble. It rinses thoroughly, leaving dirty hands clean, with no oily residue.

The hand cleaner removes grease, paint, tar, grime, inks including litho and stencil. A white stiff jell containing a generous amount of lanolin, it has no odor of solvent or ammonia. When water is not available it may be wiped off with a towel, leaving the hands soft, without a tacky feeling. Containing no alkali, it is neutral in its reactions and will not irritate or dry out the skin.

Complete information about this product may be obtained by writing to the above manufacturer.

Phosphoric Acid Type Cleaner

Klem Chemicals, Inc., Dept. MF,
14401 Lanson, Dearborn, Mich.

The above company announces a phosphoric acid cleaner in concentrate form for ferrous metals. Designated as "Rust-Sol No. 123," this cleaner can be applied either by brush-on or immersion method and rinsed off with clear water.

The product is claimed to dissolve all surface salts, rust, scale, etc. from production pieces. It neutralizes and activates the surface with a slight etch and iron phosphate coating which makes an excellent base for paint. Because of its neutralizing action, this cleaner can also be used following alkali stripping or cleaning. It is non-toxic, non-inflammable and non-volatile, emits no corrosive fumes and is used safely anywhere in the plant.

Electro Controller

H. O. Trerice Co., Dept. MF, 1420
W. Lafayette Blvd., Detroit 16, Mich.

A new electric contact controller for solenoid valves, warning signals and



LOW COST **IRIDITE** FINISHES

for zinc,
cadmium, aluminum
and cuprous
metals

provide
corrosion resistance
paint base
choice of
appearance

And they are easy to
apply! Just a simple chemical dip
for only a few seconds produces the coating.

LOW MATERIAL AND SHIPPING COSTS

combine to make Iridite the most economical chromate finish you can buy. Many Iridite chemicals are packed in powder form, thus can be shipped to you in steel pails at freight savings of up to 75%! Pails take less storage space, are easier to handle, eliminate carboys, need not be returned.

WHY NOT TEST IRIDITE ON YOUR PRODUCTS? Write for literature and send samples for free test processing. See "Plating Supplies" in your classified telephone directory or write direct.

Iridite is approved under government specifications.

ALLIED RESEARCH PRODUCTS
INCORPORATED

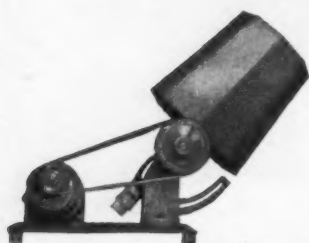
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.



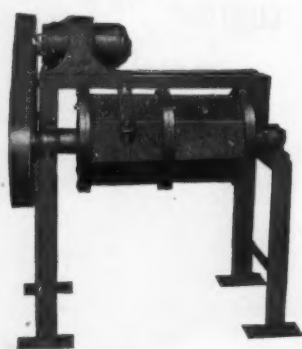
Manufacturers of Iridite Finishes
for Corrosion Protection and Paint Systems on Non-Ferrous Metals and Plating Brighteners.
L. R. TRERICE COMPANY

ON SMALL JOB LOTS

FINISHING COSTS TUMBLE



TILT-TYPE BENCH MODEL — motor or belt driven. Adjustable elevation. Steel, wood, rubber lined or alloy metal barrels.



HORIZONTAL FLOOR MODEL — light duty for bulk tumbling and burnishing of small parts.

... when you use a Henderson Oblique Tilt-type Bench Model Tumbling Barrel.

Ideal for **SMALL-LOT FINISHING** and **SAMPLE LOT PRODUCTION** of jewelry, clock parts and similar products requiring a *quality finish at minimum cost*. Widely used in laboratory experimental work.

ALSO HORIZONTAL TUMBLING BARRELS — both light and heavy duty for small-lot and quantity production.

Tumbling barrels for every purpose or, made to order to meet your special requirements.

Write now for further information.

Since 1880 Designers and Builders of Tumbling Barrel Equipment.

THE HENDERSON BROS. COMPANY
135 SOUTH LEONARD ST. WATERBURY 85, CONN.

motors has just been announced by the company.

Vapor actuated, the controller is designed to stand a fairly heavy electrical load. A unique feature of the controller is a red and green pilot light to show at a glance the position of the switch.

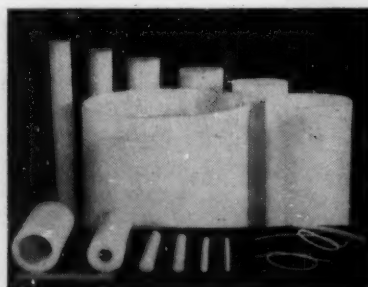
Standard controllers operate on 115 volts A.C. When specified, controllers can be furnished for currents up to 250 volts A.C. or D.C. Complete information is furnished in Bulletin No. 850 available from the company.

Polyethylene Pipe and Tubing

American Agile Corp., Dept. MF, P.O. Box 168, Bedford, O.

The above company announces the availability of a wide range of pure,

unpigmented, polyethylene pipe and tubing, called Agilene "CP." 1", 1½" and 2" N.P.S. diameter pipe are now furnished in straight 20 foot lengths for easy installation. Tubing is available from ¼" ID to 30" ID with the ¼" through 1" diameter sizes being furnished in coils, while larger tubing



is furnished in multiples of individual 4 foot sections joined by hot gas welding. The wall thickness in large diameter tubing can be supplied according to customer's requirements.

Due to the absence of any foreign matter in this tubing and pipe, all the inherent excellent chemical and electrical properties of polyethylene are retained, assuring continuous uniformity and complete freedom from contamination due to impurities. Also of interest to users will be the translucency of such tubing and piping, permitting the observation of liquid levels and general flow conditions in the pipe.

The accompanying photograph illustrates the wide range of diameters and wall thickness offered in these tubes and pipes, which are of greatest interest to a wide variety of industrial

Complete information on sizes, physical properties, as well as fitting, valves, etc., can be obtained by writing to the above company.

Pocket-Size Buff Calculator Offered Free

American Buff Co., Dept. MF, 2414 S. LaSalle St., Chicago 16, Ill.

Termed by the company, "the ideal buffing guide for shop foremen," a



clever little device is offered free on request by the above firm, manufacturers of centerless and other automatic bias buffs. Designed for quick, easy reference, this handy tool is simple to use, small and compact to fit shirt or coat pocket.

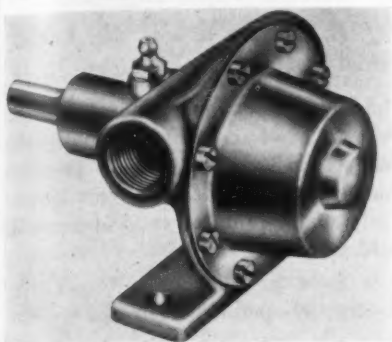
Simple directions printed right on the brightly-colored plastic case make fast, accurate buffing decisions possible on all types of jobs. Slide-rule operation answers such questions as: what type of buff is required for polishing aluminum die-castings; what diameter wheel produces a certain surface speed, etc. It helps shopmen find the right buff, the right size, the right speed for every buffing job.

Rubber Impeller Pump

Lee Healey Co., Dept. MF, 554 West Garfield, Glendale 4, Calif.

The Neovane, general purpose pump features an exclusive tapered

elliptically shaped impeller housing to eliminate the sudden impact of the impeller as it encounters cam portion of case. This greatly increases impeller life and quietness, even when operating at higher than normal speeds. This new design permits a full one-fourth of the revolution for intake, one-fourth for exhaust, and one-half for pressure build up.



The line includes three sizes: $\frac{3}{8}$ ", $\frac{1}{2}$ " and $\frac{3}{4}$ ". The entire body casting of those pumps is solid marine brass with stainless steel shafts. The shafts are grease lubricated through an alemite fitting on the top side of casting. The impeller housing is made of heavy brass and easily removed for inspection or replacement. This outer casing provides additional support for the shaft and impeller. It is self lubricated by the means of the liquid being pumped. The rubber impeller is attached to the stainless steel shaft by means of a brass pin through the impeller. The impeller hub is strengthened by a molded in metal sleeve completely rubber encased.

The pumps are stated to be excellent for stationary installation or lightweight enough for easy portability from job to job. They will pump liquids between 0°F. and 175°F. and will pass solids as large as rice grains.

Plastic Pipe Fittings

H. N. Hartwell & Son, Inc., Dept. MF, Box 30, Boston, Mass.

Exclusive distributors of rigid non-plasticized Boltaron 6200 polyvinyl chloride, the firm announces the development of threaded I.P.S. pipe fittings (tees, 45 and 90 degree elbows and couplings) molded of this corrosion-resistant material.

These fittings, in $\frac{1}{4}$ " to 2" sizes, are now carried in stock for use with Boltaron pipe for best results in overcoming corrosion problems. Pipe in sizes to match is available in 10' and 20' lengths and can, of course, be

HE HAS THE
"KNOW-HOW"
TO SERVE THIS
"WHO'S WHO" —

Monroe Auto Equipment Co.
General Motors Corp.
Oldsmobile Division
Pontiac Motor Division
Buick Motor Division
A. C. Spark Plug Division
Saginaw Steering Gear Div.

Kirsh Co.
Kelsey Hayes Wheel Co.
Ford Motor Co.
Electric Auto Lite



ARTHUR SOMERS

Michigan and
Northern Ohio Representative
of N. Ransohoff, Inc.

At your service
if you are located
in his territory.

Art Somers well typifies the creative, practical inventiveness of Ransohoff metal-cleaning experts. His conscientious analysis and helpful recommendations to important industries, characterize Ransohoff service to all users of their made-for-the-job metal cleaning and surface treatment equipment. Art Somers contributes to and shares in the over 175 years of engineering experience represented among field and headquarters staffs.

N. RANSOHOFF, inc.

EQUIPMENT FOR THE SURFACE TREATMENT OF METAL

5819 Vine Street

Cincinnati 16, Ohio

threaded using ordinary pipe dies.

Boltaron 6200 is claimed to have

outstanding resistance to organic and inorganic acids, alkalies, alcohol and



Wheels CUT FASTER, LAST LONGER



When treated with

Park

KOLD-GRIP

POLISHING WHEEL CEMENT



KOLD-GRIP Polishing Wheel Cement, laboratory-controlled through every step of production, will arrive at your plant *ready for use!* Viscosity is constant, regardless of normal temperature variations and the cement can be applied directly from the container . . . *without mixing or heating.* Kold-Grip is clean, odorless and very easy to handle.

Coarse or fine-grain abrasives set up right for fast cutting efficiency. Substantial savings are effected through longer over-all wheel life, fewer set-ups and reduced wheel inventory.

Wheels dry rapidly, are unaffected by humidity changes, and may be stored in any convenient plant area.

Let our polishing engineer demonstrate Kold-Grip for you, or send for free sample, telling us the metal to be polished, grain sizes to be used, and drying facilities available. We can help you if we hear from you.



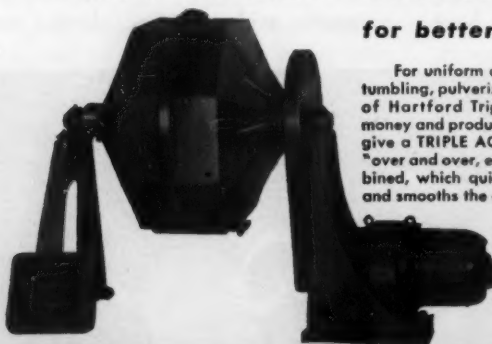
• Liquid and Solid Carbonizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pel Carbon • Charcoal • No Carb • Carbon Preserver • Swamping and Tempering Oils • Browning Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement

MANUFACTURED BY: Electric Resistance Furnace Co., Inc., Westfield, Mass., U.S.A.

HARTFORD TRIPLE ACTION

CUTTING and TUMBLING BARRELS

for better work in less time!



For uniform cutting down, wet or dry grinding, tumbling, pulverizing and mixing, the unique design of Hartford Triple Action Barrels saves time and money and produces better results. Hartford Barrels give a TRIPLE ACTION in tumbling the material, an "over and over, end to end, folding-in" motion combined, which quickly grinds off burrs, and finishes and smooths the general surface of any article in the load. These barrels are available in two sizes, large and small, and with both motor and belt drive. Hartford also makes steel burnishing balls scientifically correct in design and material for each specific job. Bulletin on request.

THE HARTFORD STEEL BALL CO.

HARTFORD 6, CONN.

DETROIT
W. S. TURNER
402 NEW CENTER BLDG.

CHICAGO
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foodstuffs. Unlike the so-called "hard" vinyls, it retains the unmodified properties of pure polyvinyl chloride which are superior in every respect where greater hardness, toughness and rigidity are desired. Laboratory tests are continuously carried on and information on many chemicals is available on request to the company.

Electric Vapor Degreaser

J. D. Wallace & Co., 142 S. California Ave., Dept. MF, Chicago 12, Ill.

Selling for approximately one-half the price of comparable units, the Wallace DG-1 Degreaser provides many exclusive features not previously available in the vapor-degreasing field.

It is a production unit, portable, electrically-operated, insulated thermostatically-controlled, and ready for use in a fraction of the time ordinarily required.



Provided with either a 110 or 220 volt heating element, it is ready for instant plug-in operation. Heat-up time is less than 20 minutes, and requires only 2½ gals. of solvent. The manufacturer's non-inflammable Xsol solvent vaporizes at a higher moisture-dispelling temperature and this, coupled with a hot-dip galvanized steel tank, practically eliminates rusting and corrosion problems common with water-cooled units.

The caster-mounted base and plug-in feature makes portable operation practical, permitting use of the unit at different work-stations for greater efficiency, lower investment cost, and greater space-savings. The thermostatic control maintains a constant vapor level and prevents overheating; unique insulation provides for safety, efficiency, and comfortable use.

Careful engineering has provided for quick and easy attachment of a

flusher pump, lip-vent, 21" dia. work-baskets, and other accessories required on some degreasing applications.

For bulletins and prices write the above company.

Nylon Fabric for Anode Bags and Diaphragms

The Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

A new specially-treated nylon fabric for anode bags and diaphragms is now available. Known as NW Nylon, the new cloth increases the life and reduces the replacement cost of anode bags and diaphragms used to screen anode-sludge from the plating solution.

Laboratory and field tests indicate that the new fabric has greater resistance to chemical action and abrasion than cotton duck; has greater resistance to chemical action than other Nylons; is particularly resistant to hot caustic solutions; and does not become salt incrustated.

Complete information on NW Nylon bags and diaphragms for given applications may be obtained by writing the above company.

Cleaner for Assembled Motors & Generators

The Shaler Company, Dept. MF, Waupun, Wis.

A new solvent that cleans electric motors and generators while they are still assembled has been announced by the company. This new product, called Shaler Generator-Motor Cleaner, is listed under the Reexamination Service of Underwriters' Laboratories, Inc.

According to the company, motors and generators can be cleaned two different ways, with this solution:

(1) A motor can be completely submerged in the cleaner, then plugged into electric current and allowed to run for from three to five minutes. The motor is then removed from the dip tank and dried with compressed air.

(2) The cleaner may be sprayed into the intake side of a motor, while it is in operation.

Motors which have been accidentally submerged in water as a result of fires, flood, etc., may be cleaned without "baking."

The new cleaner does not affect wiring or insulation which is gasoline- or oil-resistant.

Shaler officials point out that this

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Industrial Thermometer
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No. V80200



Pressure Gauge
No. 300

These Trerice indicating instruments give you hair-line accuracy on all kinds of industrial and laboratory jobs. They'll provide many years of trouble-free service, and they're priced right!

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No. M82117



Gauges
No. 83500

You can count on Trerice recording instruments. Thermometers are mercury-, vapor- and gas-actuated—one for any job where written records are necessary. Recording pressure and vacuum gauges, too, are built for long life.

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Non-Indicating No. V85002

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DOES IT FOR LESS!



Kreider Dryer with auxiliary gas heating unit (illustrated). Auxiliary steam heating unit available; also standard model without auxiliary heating.

Basket (shown below). Heavy gauge steel woven mesh over steel frame. Capacity, 1140 cu. ins.

Spin-Dries* up to 50 pounds in less than 2 minutes

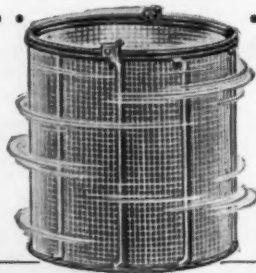
Simple design . . . careful engineering, sturdy construction assure trouble-free, low-cost maintenance operation. Operates at 625 r.p.m. on less than 1 h.p.

No scarring or marring . . . with Kreider Dryer. Centrifugal force holds parts immovable in basket . . . assures smooth, evenly dried surfaces, long-lasting luster, minimum "rejects".

One man runs it! Standard model Kreider Dryer occupies less than 6 sq. ft. floor space. One man tends—loads, unloads—keeps production moving, prevents expensive, time-wasting tie-ups.

See for yourself! Write Dept MF 253 today for illustrated 4-page folder . . . also addresses of installations near you.

New Holland Machine Co., New Holland, Pa.



***Only 2 simple steps required. . .**

- (1) Operator places wire mesh basketful of small parts in Dryer . . . turns motor "ON."
- (2) Operator turns motor "OFF" . . . presses foot brake . . . removes basket.



NEW HOLLAND *KREIDER* DRYER

new product has been used in the Shaler plant with very satisfactory results for more than a year. The company has about 300 motors, and the plant superintendent has a periodic motor-cleaning schedule which involves cleaning about twenty motors each week, to keep them at peak operating efficiency. The use of the cleaner has materially reduced the time and expense formerly required for this cleaning operation.

Lightweight Flexible Hose

*American Ventilating Hose Co.,
Dept. MF, 100 Park Ave., New York,
N. Y.*

Three new and improved types of Flexaust, the spiral wire reinforced

flexible hose, are now available, it was announced by the above company. Because of their new double-overlap construction, the new types are said to have double the resistance to flexing fatigue, greatly increased tensile strength and greater resistance to abrasion wear, while being lighter in weight than the old types they replace. Designated Type CFL, CWC, and CWY, the new types replace the CWS, CWM, CWR and RS types which will no longer be manufactured. The company will continue to manufacture their Portovent and Bloflex, ring reinforced and non-reinforced, hose types. The new construction is reported to make many additional uses possible in the handling of air, gases or materials by pressure, suction or gravity flow.

BUSINESS ITEMS

**John R. Gumm Elected
Vice-President of Frederick
Gumm Chemical Co., Inc.**



John R. Gumm

John R. Gumm was recently elected Executive Vice-President and General Manager of the *Frederick Gumm Chemical Co., Inc.*, 538 Forest St., Kearny, N. J., manufacturers of Clepo Products and national distributors of Plating and Polishing Equipment and Supplies.

John R. Gumm attended Rutgers University, and then became affiliated with the *Frederick Gumm Chemical Co., Inc.* in July, 1936.

Pennsalt Names Agent for Corrosion Products

The *Pennsylvania Salt Mfg. Co.* has announced that *Henry S. Rondeau* and the *Cleveland Industries Co.*, 1935 Euclid Ave., Cleveland, have been appointed representatives for Pennsalt's corrosion engineering products in Ohio and northern Kentucky.

This organization will be agents for Pennsalt's corrosion-resistant cement mortars and coatings for construction, chemical and allied, petroleum and petrochemical, pulp and paper, primary and secondary metals and food industries in this territory.

Distillation Products Industries now Consolidated Vacuum Corporation

Effective December 28, 1952, the vacuum equipment department of *Distillation Products Industries*, Division of Eastman Kodak Co., became the *Consolidated Vacuum Corp.*, a wholly owned subsidiary of Consolidated Engineering Corp. of Pasadena, Calif.

The merger of Consolidated Vacuum and Consolidated Engineering brings together the oldest and largest manufacturer of high vacuum equipment and one of the outstanding manufacturers of electronic equipment. It is expected that most, if not all, of the personnel of the vacuum equipment department of Distillation Products Industries will go with the new company and that there will be little or no change in the quality of product and service which has been offered heretofore by Distillation Products Industries.

Sussman Appointed General Sales Manager at Columbia Electric

Columbia Electric Mfg. Co., manufacturer of electrical equipment, recently announced the appointment of Homer W. Sussman as general sales manager.

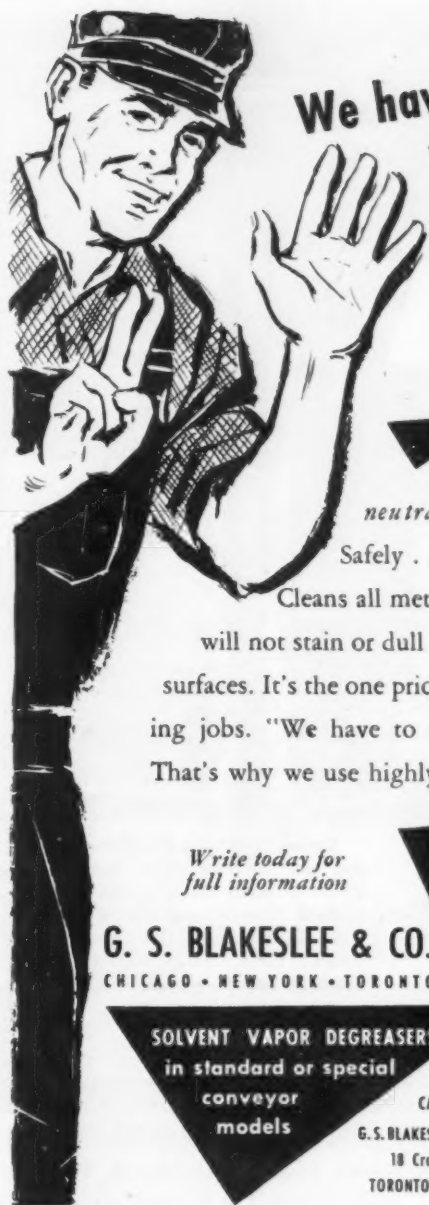
Mr. Sussman joined Columbia as a student engineer in 1935, immediately after receiving his B.S. degree in Electrical Engineering from Case Institute of Technology, and has held various positions in the engineering and sales departments. In his new position he will assume responsibility for an expanded sales program covering the company's line of alternating and direct current generators, low voltage generators and motor generator sets, synchronous motors, tank rheostats and electrical instruments.

A member of the American Institute of Electrical Engineers, and Asso-



Homer W. Sussman

ciation of Iron and Steel Engineers, Mr. Sussman resides with his wife and daughter at 3689 Glencairn Road, Shaker Heights, O.



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BLACOSOLV gives you greater stability with its neutral stabilizers. Does the job Safely . . . Quickly . . . Economically.

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NIAGARA-METAL PARTS WASHERS—built to fit your needs

Duriron Announces Personnel Changes

The Duriron Company, Inc. announces the following personnel changes which became effective during the month of November, 1952.

Richard Schermer has been named manager of pump sales. He joined Duriron in January, 1952, as building equipment sales manager after having served from 1945 as Eastern District manager for Hills-McCanna Co.

R. A. Prosser becomes manager of building equipment sales. He has been Chicago district manager for the company since 1945. Wendell A. Watkins has been promoted to Chicago district manager from Buffalo, and is suc-

ceeded by D. E. Christie who becomes manager of the Buffalo sales territory.

G.E. Announces New Motor Service Plan

A new program to provide General Electric customers with prompt service on inoperative electric motors has been announced by W. D. Lee of the G-E Small and Medium Motor Department.

Called the Small Motor Service Station Plan, the program is expected to improve previous exchange plans by providing a more complete network of repair for G-E fractional horsepower and small integral horsepower motors. In general, it was developed to better serve the requirements of original equipment manufac-

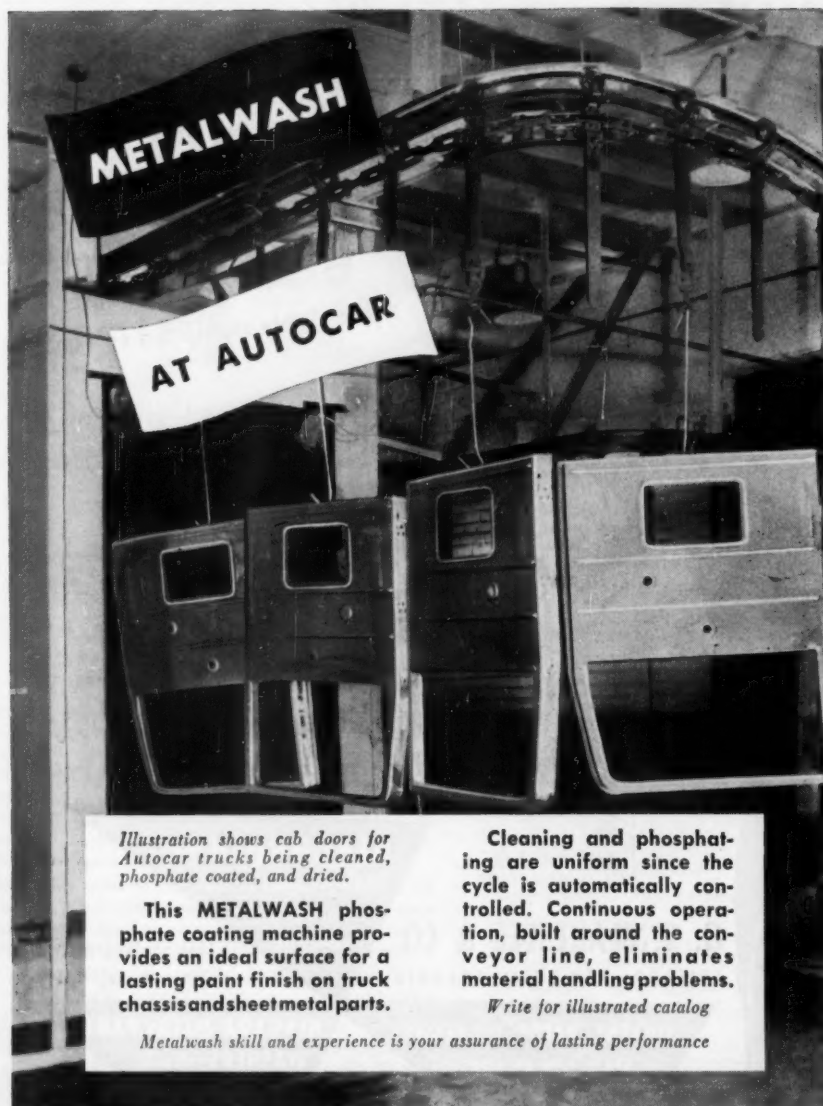


Illustration shows cab doors for Autocar trucks being cleaned, phosphate coated, and dried.

This METALWASH phosphate coating machine provides an ideal surface for a lasting paint finish on truck chassis and sheet metal parts.

Cleaning and phosphating are uniform since the cycle is automatically controlled. Continuous operation, built around the conveyor line, eliminates material handling problems.

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turers with a wide-spread system, to which their customers and dealers can refer inoperative motors.

Under the plan, an authorized service station will provide in- and out-of warranty service on G-E motors, generators, and motor-generator sets of 1/20 to 15 h.p. and 1/4 to 10 kw. The service will include general repairing, furnishing renewal parts, and exchanging motors for those that are inoperative.

Present plans for the program call for the authorization and franchising of up to 180 key repair stations throughout the country. Each service station also will be offered a franchise as a distributor for G-E singlephase motors and motor renewal parts.

Udylite Appoints Gerada Sales Engineer in Cincinnati Area

Appointment of *Arthur F. Gerada* as sales engineer on the *Udylite Corp.* Cleveland district sales staff has been announced by *A. J. Lupien*, Cleveland district sales manager.

Working out of the Cleveland office, he will call upon Udylite customers in the Cincinnati area.

Gerada has been with Udylite for two years as a service engineer and control chemist in the Detroit customer service and pilot laboratories.

Prior to joining the company, Gerada was graduated from Michigan State Normal College with a B.S. degree in Chemistry. During World



Arthur F. Gerada

War II, he served with the U. S. Air Force.

Stringham Succeeds Potter at G.E.

Warde B. Stringham, of Washington, D. C., has been elected a commercial vice-president of the *General Electric Co.*, by the board of directors. G.-E. president *Ralph J. Cordiner* has announced.

Assigned to Washington, Mr. Stringham will succeed *Edwin E. Potter*, Washington vice-president of the company, who is retiring after 43 years of service.

Mr. Stringham, executive assistant to Mr. Potter, was for 13 years Washington district manager for the General Electric Supply Corp., and was appointed a commercial vice-president of that company in 1951. He left the Supply Corporation last year to join Mr. Potter in the operation of the Government business services group of General Electric.



Warde B. Stringham



Edwin E. Potter

Mr. Stringham was born in Bountiful, Utah on June 16, 1898, and was graduated from the University of Utah School of Business in 1920.

He joined General Electric in 1934 as president of Southern Appliances, a G.E. subsidiary, and in 1936 became district manager of the General Electric Supply Corp. in New Orleans.

He came to Washington the following year as district manager for the supply corporation and established the Chesapeake District, which includes Baltimore, Washington and Wilmington.

He is a member of the Washington Board of Trade, Board of Governors, Better Business Bureau, Rotary Club, Army-Navy Club, Columbia Country Club and was a director and past president of the Electrical Institute of Washington.

George W. Schwarz now Vice-President and Treasurer of Wyandotte

George W. Schwarz, since 1948



George W. Schwarz

vice-president-controller of *Wyandotte Chemicals Corp.*, has been promoted to vice-president and treasurer, *Robert B. Semple*, president, announced following the year-end meeting of the board of directors.

Schwarz, a resident of Plymouth, Michigan, and a native of Brooklyn, N. Y., is a certified public accountant and has served in various accounting capacities with industrial corporations in the Detroit area. In 1925, he joined the staff of Ernst and Ernst, public accounting firm, and in 1938 moved to Wyandotte as controller.

Robert R. Sizelove to Re-Activate Consulting Firm

Robert R. Sizelove has announced

his resignation as Vice-President of the *Frederick Gumm Chemical Co.* effective December 31, 1952.

"Bob" plans to re-activate the consulting firm of *Oliver J. Sizelove and Sons*. This firm was originally established by *Oliver J. Sizelove, Sr.* in 1928. Bob Sizelove joined with his father in 1936 and continued until 1942.

The re-activated firm intends to expand its original activities to offer consulting service in the fields of Industrial Finishing, and Industrial Management.

The Industrial Finishing Section will be headed by Bob Sizelove to offer consulting experience on electroplating, metal cleaning, polishing and

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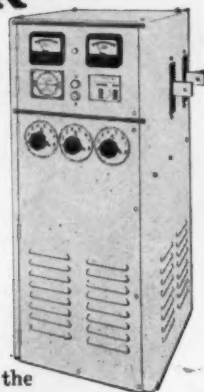
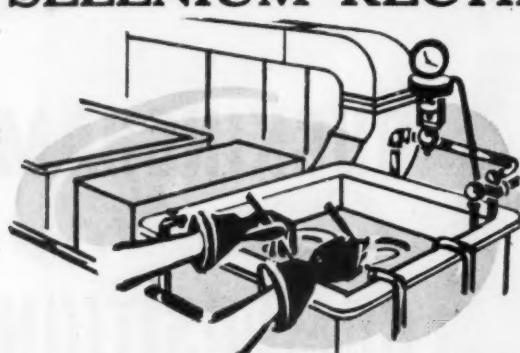
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for Samples**

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No Guesswork Here . . . It comes out right **RICHARDSON-ALLEN SELENIUM RECTIFIER**



When "it comes out right" consistently, you know the satisfying result — greater output, highest quality, fewer rejects, lower labor costs.

This profitable achievement depends not only on your own skill and ability. It also requires and deserves the most dependable rectifying equipment.

You can assure the dependability of your d.c. supply by installing Richardson-Allen Selenium Rectifiers which have established records in hundreds of plants for long, trouble-free service.

The Richardson-Allen line includes various types and the widest selection of voltages and currents. For example, all models may be standard or plus rated; there is a choice of basic and remote controls; self-contained; heat exchanger; sequence programming controls; anodizing, and also suitable equipment for manodizing.

There is an R-A factory representative in most major cities. If you do not find him in your phone book, write directly to us.

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SET IT and FORGET IT



Oliver J. Sizelove, Jr.

buffing, barrel tumbling and conversion coatings.

The Industrial Management section will be headed by *Oliver J. Sizelove, Jr.* to offer consulting service in the fields of plant layout, methods engineering, time study, quality control, and wage incentives. At present O. J. Sizelove, Jr. is connected with the Newark College of Engineering as Professor and Executive Associate of the Department of Management Engineering, in both the Undergraduate and Graduate Schools. He is a Licensed Professional Engineer in the state of New Jersey.

Glennon Appointed Sales Engineer Kold-Hold Platecoil Division

Charles E. Glennon has been appointed sales engineer for the *Platecoil Division* of the *Kold-Hold Mfg. Co.*, according to an announcement by *C. P. "Bill" Yoder*, division sales manager. Glennon comes to Kold-Hold with six years' experience as Chief of the Industrial Division and Production Engineer for the Chicago Chemical Procurement District of the U. S. Army. He was responsible for procurement activities in all lines of manufacturing and chemical processing in sixteen states of the highly industrial Middle West. Previous to this Glennon served the same organization as Chief of Munitions responsible for the establishment of production lines for the 4.2" chemical mortar ammunition and incendiary bombs.

Glennon's professional career started with postgraduate work in metallurgy, engineering and journalism. Following this he served six years as assistant to the Chief Inspector and Engineer of Tests at the Gary Works



Bob Sizelove



Oliver J. Sizelove, Sr.



Charles E. Glennon

of Carnegie Illinois Steel Corp., where he was also a customer service representative.

Industrial Washing Machine Corp. Opens New Plant

According to an announcement by Howard M. Sadwith, president, *Industrial Washing Machine Corp.*, the company has moved from New Brunswick to 32 Main St., Matawan, N. J.

The move, said Sadwith, was occasioned by the need for expanded manufacturing facilities and substantially increased plant area. The new plant will have four times the floor space of the old plant, and production schedules will be substantially increased to meet the increasing demand.

As exclusive agents for the manufacturer, *Industrial Systems Co.* will continue to handle all sales matters through its New Brunswick, N. J. office.

Diversey Installs Facilities for Research With Radioactive Tracers

The *Diversey Corp.* is entering into the field of applied nuclear research that is expected to help to develop new and improved pre-finishing cleaners as well as new type protective and decorative coatings for the metal industry, it has just been announced. The purchase of radio active isotopes from the government's atomic pile and the necessary equipment for measuring their presence and radiation will be employed to test effectiveness and behavior of metal cleaners.

In testing cleaning compounds, for example, tagged or radio active carbons are incorporated into soil. The soil is then spread upon the surface to



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Cut on the bias for long, rugged service
Steel center is perforated for cool running
Engineered throughout for perfect balance

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new CUTMASTER can cut your automatic
buffing cost now—write, wire or phone!

WILLIAMSVILLE BUFF DIVISION

The Bullard Clark Company

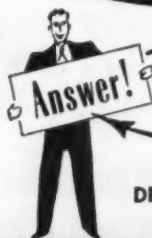
DANIELSON, CONNECTICUT



Rosemary Annos and Leslie Alt, of the Diversey laboratories, taking the count per minute of a radioactive sample from the nuclear scaling unit at left. On the right is a count rate meter which serves as a monitor and a rate meter. This is part of the equipment Diversey will use in the field of applied nuclear research for the metal industry.



How to Solve Your Thickness Problems?



With the New KOCOUR Electronic Thickness Tester!

DETERMINES THE THICKNESS OF METALLIC COATINGS
BETTER! . . . FASTER! . . . EASIER! . . . CHEAPER!



The new KOCOUR ELECTRONIC THICKNESS TESTER is the answer to your thickness problems . . . QUICKLY and almost AUTOMATICALLY . . . this highly accurate instrument can determine the thickness of all the commonly plated metals on various base metals . . . thus putting an end to costly rejects and reworking.

KOCOUR'S NEW ELECTRONIC THICKNESS TESTER HAS THESE OUTSTANDING FEATURES:

- Set is self-contained.
- 90-95% accurate depending upon type and thickness of the plate.
- Average test requires only about 1 minute.
- Minimum thickness determined is 500,000's of an inch (5,000,000 for chromium).
- Maximum thickness determined is indefinite.
- Operates virtually automatically.
- Reads directly . . . no calculations necessary.
- Relatively insensitive to surface roughness.
- Compactly housed in portable metal cabinet, 17½x10½x10".
- Operates from 105-125 volt, 60 cycle, A.C. electric outlet.

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Pioneers and Specialists in Testing Equipment Since 1924.

P.S. Whether your set-up calls for small or large volume work . . . there's a specialized KOCOUR SET for your requirements . . . developed to do a faster, better, more economical job.

be cleaned. After cleaning, on what would appear to be a clean surface, small amounts of the radio active soil could be detected on the electronic instrument. The soils are detected quantitatively. Where no count could be measured it would indicate the cleaner was very effective in removing the particular soil.

Apart from using the radio active material to determine how effective certain cleaners are in removing soils from metal surfaces prior to electroplating, the new research technique is expected to successfully solve such problems as determining corrosion or absorption of inhibitive chemicals on metal and the effect of impurities in the plating solution.

Besides radio active carbon, radio

active glucose and calcium are also available from the government, as well as many synthesized chemical compounds having radio active carbon. These will be introduced into products and material pertaining to the above research problems by Diversy.

Oakite Representative Receives Distinguished Service Award

L. T. Prince, technical service representative of Oakite Products, Inc., manufacturers of industrial cleaning and allied materials, at right, shown receiving the D. C. Ball Award for Distinguished Service from John A. Carter, Oakite president. The award, in the form of a bronze plaque, is presented annually to the member of the firm's nation-wide field organiza-



tion adjudged to have rendered the most outstanding service to industry during the year. Presentation of the award which is given in memory of David Clifton Ball, pioneer in industrial cleaning procedures, founder of the company, and former chairman of its board of directors, was made at a technical-sales conference of Oakite field representatives held recently at the Sheraton Hotel in St. Louis.

Harold Larsen Appointed by International Nickel

Harold Larsen has been appointed assistant to the manager of the nickel sales department of The International Nickel Co., Inc., according to an announcement by Walter C. Kerrigan, vice-president and general sales manager.

For the past twenty-six years Mr. Larsen has been with Inco's nickel sales department where he has been assistant section head in the distributors' sales section. Recently he has been on the staff of the National Production Authority at Washington as Chief of the Nickel Section of the Iron and Steel Division. He is a member of the American Foundrymen's Society and the American Society for Metals.

Mr. Larsen resides at 3 Mountain Avenue, Park Ridge, New Jersey.

Washer Manufacturer Adds New Plant

Start of construction on a new plant in Sharonville, O., near Cincinnati has been announced by H. E. Huddle, president of Cincinnati Cleaning & Finishing Machinery Co., Ironton and Cincinnati, O.

Erection of the new plant is part of an expansion plan which the firm instituted at the end of World War II. While sales and engineering offices

have been maintained in Cincinnati, previously all manufacturing production was carried on in two plants located in Ironton.

The new plant will be completed some time after the first of the year. It will comprise about 15,000 square feet of manufacturing space in addition to sale and engineering offices which will be moved from the present location in downtown Cincinnati. Located in the northern section of Sharonville, the new plant's five-acre site is convenient to transportation facilities.

Operation of the Ironton plants will be continued, according to Mr. Huddle, with the new plant adding manufacturing facilities required to meet present volume of orders for the company's metal cleaning and finishing machinery.

Pittsburgh Lectordryer Appoints Hartzell C. Mills

Hartzell C. Mills has been named Minnesota representative for Pittsburgh Lectordryer Corp., manufacturer of industrial dehumidifiers, according to an announcement by George Simpson, vice-president and general manager.

Mills is a graduate of the University of Minnesota, served as industrial engineer with Minneapolis Gas Co. from 1933 to 1948, and has since been a manufacturers' representative in the industrial field. His office is at 1954 University Ave., St. Paul.

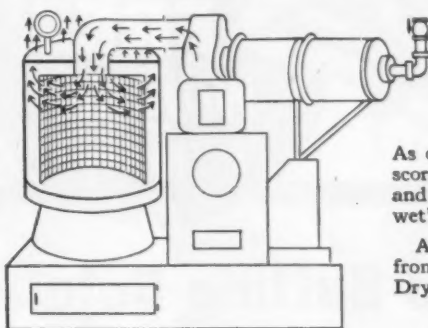
Bryant Joins Whitfield Chemical

C. Whitfield Smith, president of the Whitfield Chemical Co., Detroit manu-



Nathan H. Bryant

EVER BLOW INTO AN ASH TRAY?



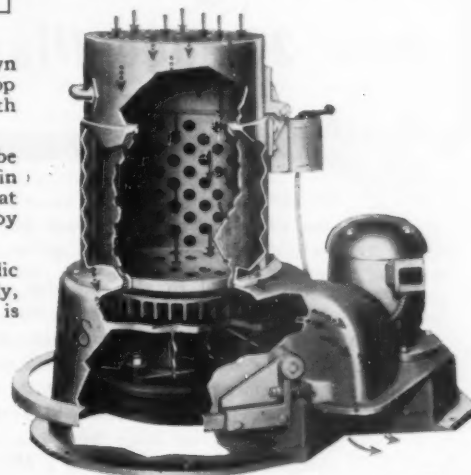
If you did, you saw a practical demonstration of the principle of air deflection. In old type dryers, air *blown* in from the top is deflected by the top layer of parts. As one user put it, "the top layer gets scorched, the next layer is nice and dry, and from there on down the parts are still wet".

A powerful suction fan *draws* the air from the bottom of the modern Nobles Dryer. Fresh air rushes in from the top

to fill the vacuum and is drawn through the entire contents from top to bottom where it is expelled with the water.

Steam or electric heaters may be mounted compactly in the cover in contrast with space consuming, heat wasting, separate units connected by pipe.

An internal expanding, hydraulic brake stops the machine smoothly, and quickly. The "brake pedal" is a ring extending around the entire working area so that the machine can be stopped instantly from any working position. In the interest of faster drying and lower costs write today!



NOBLES ENGINEERING & MANUFACTURING CO.

647 EAST SEVENTH STREET

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WRITE FOR
FREE Folder

facturers of metal cleaning and finishing chemicals, announces the appointment of Nathan H. Bryant as their western Michigan representative. Mr. Bryant was formerly associated with Attwood Brass Co., Grand Rapids, Mich. He will make his headquarters in that city.

Warren E. Scoville, Jr., Appointed by U. S. Rubber Co.

Warren E. Scoville, Jr. has just been appointed assistant manager of the development department of United States Rubber Co.'s plant in Passaic, N. J., according to an announcement by Henry W. Willard, factory manager.

In his new capacity, Mr. Scoville will be responsible for further development of the 33,000 mechanical rubber

and plastic products now made in the Passaic factory, and the development of new rubber and plastic products.

Lawrence Cranston is the development manager at the plant, which has approximately 3,100 employees.

Mr. Scoville has been in the company's development department since graduating from Stevens Institute in 1934. His home is at 58 N. Spring Garden Avenue, Nutley, N. J.

Canadian Permag Building Another New Factory

After having found it necessary to utilize greater manufacturing space on two separate occasions within recent years, the Canadian Permag Products Ltd. are now in the process of building their own larger plant in St. Lambert, a suburb of Montreal according



Polishing and Buffing Data! New 20-Page Illustrated Book



IF YOU want to improve your polishing and buffing operations, you will want to write today for your FREE copy of this newly-revised, easy-to-read, 20-page booklet.

Included in this booklet are: a handy selector chart for choosing the correct composition for polishing, buffing and finishing various metal surfaces; descriptions and applications of all types of compositions, and many types of buffs and wheels; a convenient table for determining wheel speeds, and other valuable information — ready reference data that should be in your files — and on your finishing room desk . . . Write, without obligation on your part, for a FREE copy of this valuable, helpful booklet — today. Address "Speedie Division."



Polishing Room Supplies and Equipment

THE BUCKEYE PRODUCTS CO.

7033 Vine Street Cincinnati 16, Ohio

Cable address: Buckprod

to president *Allen A. Rylander*.

General offices will be housed in the same building and the move into the new location next spring will coincide with the company's twentieth anniversary. Sufficient land has been bought to enable Permag to treble these new requirements.

The company manufactures a wide range of industrial cleaning compounds and solvents, and performs a technical service to all types of manufacturing industries from coast to coast, in Canada. It is affiliated with the *Magnuson Products Corp.* of Brooklyn, N. Y.

Charles A. Frawley Joins Northwest Chemical Sales Staff

Charles R. Frawley has joined the

sales staff of the *Northwest Chemical Co.*, 9310 Roselawn Ave., Detroit 4, Mich., to service accounts in northern Ohio. Mr. Frawley, a native of Cleveland, served with the U. S. Marine Corps in the South Pacific. Since leaving the service, Mr. Frawley has earned a degree from Western Reserve University, worked in various capacities with the Ohio Department of Liquor Control, the Pennsylvania Railway. The Klass Machine and Manufacturing Co. and the Waverly Petroleum Products Co. Mr. Frawley's academic and industrial background equips him to serve well the technical problems encountered in the metal finishing industry.

Metals Disintegrating Co. Appoints Hal R. Sheaffer



Hal R. Sheaffer

Hal R. Sheaffer has been appointed as manager of pigment development for *Metals Disintegrating Co.*, Elizabeth, N. J. He will specialize in development and sales work in connection with metal pigments, particularly gold bronze powders.

Associated with *Sherwin-Williams Co.* for many years, Sheaffer was also executive vice-president of *Malone Bronze Powder Works, Inc.*, Malone, N. Y., and later, executive vice-president of *Ohio Bronze Powder Co.*, Cleveland, O.

Among the first to recognize the potentials of aluminum paste pigments for maintenance and industrial finishes, Sheaffer was responsible for much of the early development work in the industrial field.

American Cyanamid Appointments

American Cyanamid Co.'s Industrial Chemicals Division announced today two new appointments in its Metal Chemicals Section. *Paul J. Kondla* was named Eastern regional representative, replacing *A. E. Broady* who will serve as a representative in the Cleveland district.

Mr. Kondla, a graduate of the University of Connecticut in 1938 with a B.S. degree in chemistry, comes to Cyanamid from the *Whitney Chain Company*, Hartford, Conn. He has served as a member of the advisory board and several committees of the Society of Automotive Engineers, and has been active in the American Society for Testing Materials, American Chemical Society, and American Management Association.

Mr. Broady, who joined Cyanamid in 1949, was graduated from the Royal Institute of Technology, Stockholm, Sweden in 1935 with an M.S. in Metallurgical Engineering. Before coming to Cyanamid he was an assistant metallurgist with Curtiss-Wright Corp., Caldwell, N. J.

N.M.T.A. Reports Demand for Industrial Information

According to a report issued by Commissioner George J. Earl of the National Metal Trades Association, there has been an increasing demand for general text material in the field of industrial education and job and salary rating information by educational institutions, government agencies, and branches of the Armed Forces.

Earl reported that 941 requests for copies of Machine Shop Technology were received from governmental services and agencies, most of them engineering and construction branches of the Army and Navy.

Requests for material on Job and Salary Rating still continue to lead the requests from member companies, as well as from educational institutions and government agencies.

New Laboratory and Plant of Smoothex, Inc.



The above photograph shows the new building recently completed by Smoothex, Inc. at 10705 Briggs Road, Cleveland 11, Ohio. For further details, which were released by Lloyd B. Portzer, President of the firm, we refer you to page 137 of our January issue.

Oakite Holds Sales Conferences

Field service representatives from the Canadian, Chicago, New England, New York, and Philadelphia sales divisions of Oakite Products, Inc., met for a series of technical-sales meetings at the Roosevelt Hotel, New York City, Dec. 8-10, 1952.

Similar meetings for other divisions were held in Hollywood, Calif., and St. Louis, Mo., during November.

Featured at the meetings were reports from the company's research chemists, service engineers, and technicians on recent developments in



Smooth—Stain-free—Spotless! There's nothing like a dip to brighten and improve the appearance. This applies not only to a four-year-old but also to metal. For junior it's soap—for metal it's Mutual's Chromium Chemicals.

Leading brass manufacturers find a Sodium Bichromate dip, with sulfuric acid, to be the most effective treatment for removing stains resulting from annealing. A metal surface uniformly clean, bright and pleasing in appearance emerges from this bath.

Many other metal treatments employ Bichromate. Used on aluminum and magnesium it contributes to the development of corrosion-resistant films. Mixtures including Bichromate or Chromic Acid are used to form protective and paint-base coatings on iron, steel, zinc, cadmium, aluminum and magnesium.

Mutual's Research and Development Department has a wealth of technical data on the use of Chromium Chemicals in metal treatment. Inquiries are welcome.



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cleaning and related procedures designed to assist industry in combating rising operating costs.

Honeywell Elects Glenn Seidel to Vice-Presidency

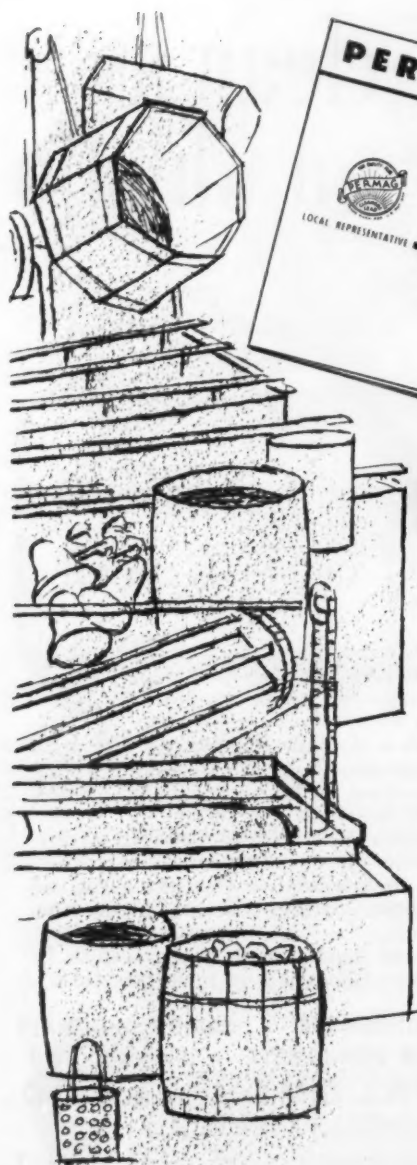
Glenn E. Seidel has been elected a vice-president of Minneapolis-Honeywell Regulator Co. in charge of engineering in the company's Minneapolis plants, Harold W. Sweatt, president, announced recently.

Seidel, a member of Honeywell's engineering organization since 1943, has been director of the company's expanding ordnance division for the past year and a half. Before that he served for a number of years as assistant to W. J. McGoldrick who, as part of his duties as vice-president, has

been handling the engineering activities that Seidel will take over.

In his new post, Seidel will have complete responsibility over research activities and all engineering work carried on in the Minneapolis plants, other than that involving aero products.

Seidel was graduated with distinction in 1936 from the University of Minnesota, where he was a star athlete. He was a quarterback during three years of varsity football and captained the 1935 championship team. Following graduation, he was football coach at Tulane University for four years. He spent a year with Coca Cola Company before joining Honeywell's engineering department in 1943.



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Manufacturers' Literature

Automatic Plating Machines

Frederic B. Stevens, Inc., Dept. MF,
Detroit 16, Mich.

A completely new bulletin, No. 61, on Automatic Rack Type Plating equipment is now available from the above company, giving complete descriptions and illustrations of the Stevens automatic rack type machines.

Many of the special applications that these machines are capable of handling such as heavy duty cleaning and pickling and automatic bright dipping are also illustrated.

These machines are unique because of their compact sturdy design which eliminates high super-structure and enables low-cost volume processing to be accomplished in a minimum of floor space.

Barrel Finishing Portfolio

Wyandotte Chemicals Corp., Dept. MF, Wyandotte, Mich.

An informative discussion of barrel finishing procedures is available from local company representatives or by writing the above company direct.

Included in the discussion are outlines of seven operations which can be performed in finishing barrels. Recommended procedures are given for

the bulk finishing of parts made of 11 different kinds of metals.

This plastic-bound portfolio on barrel finishing is "No. 1 of a Series of Aids to Industry."

Temperature Instruments

H. O. Trerice Co., Dept. MF, 1420
West Lafayette Blvd., Detroit 16, Mich.

A new bulletin covering temperature instruments for the metal finishing industry has just been announced by the above company.

The bulletin describes thermometers, pressure instruments, temperature controllers and steam traps. Typical plating installations are diagrammed. A portion of the booklet tells why automatic temperature control is essential to plating operations.

Copies of Bulletin 803 can be obtained from the above company.

Infrared Radiant Panel Specifications

Edwin L. Wiegand Co., Dept. MF,
7627 Thomas Blvd., Pittsburgh 8, Pa.

Specifications of the new Chromalox electric far-infrared radiant panel are detailed in a new folder L-1093, for use by Federal, State, and local government purchasing agencies, and others required to purchase by invitation and bid.

Twenty-four separate items are covered to include every component part and characteristic of the panel in non-restrictive language. The modular panels are assembled into complete infrared ovens, and include full insulation and electric bus.

Electroplating Large Complex Shapes

International Nickel Co., Inc., Dept. MF, 67 Wall St., New York 5, N. Y.

Four pages illustrated—points out that the more modern plating plants, making the utmost use of chemistry, electrochemistry, plating engineering and plating "know how," are successfully electroplating nickel on large, complex equipment up to 700 square feet in area. For handling corrosive materials, heavy electroplated metallic coatings will supplement, or substitute for, clad metals, wrought metals and alloys not only as a means of conservation but, in many cases, as an economic measure. This is particularly true where a large number of pieces of the same size and shape are re-

quired. Design factors, welds, preparation and plating methods are discussed.

Tygon Corrosion-Resistant Gasketing

The U. S. Stoneware Co., Dept. MF, Akron 9, O.

This 4-page, 2-color bulletin, G-520, gives complete information on the basic compositions and physical characteristics of Tygon gasketing. It tells where and how Tygon gasketing is applied. It provided a frank discussion on the advantages and disadvantages of Tygon compounds over other gasketing materials. Charts showing the complete line, plus an excellent table on specific applications of standard Tygon gasketing formulations are also included.

Readers can obtain copies of this new bulletin, without charge.

Report on Demineralized Water

Research Department, Barnstead Still & Sterilizer Co., Dept. MF, 129 Lanesville Terrace, Forest Hills, Boston 31, Mass.

The research department of the company has prepared an informative, eleven page report on the "Uses For Demineralized Water" together with a Water Analysis Study. This report gives comprehensive information on the uses of demineralized water and points up the advantages of demineralized water in manufacturing and processing operations.

Industrial Lighting

Inquiry Bureau, General Electric Co., Dept. MF, Nela Park, Cleveland 12, O.

The latest and most elaborate of a series of "See Better—Work Better" bulletins, designed to promote improved lighting in the nation's industrial plants, has been issued by General Electric's Lamp Division.

Bulletin No. 8, an eight-page illustrated publication in full color, describes what it calls the "revolution in industrial lighting." This revolution, it states, is based on the concept of balanced brightness, as well as sufficient light, over the entire work area. Benefits are listed as better workmanship, faster output, reduced spoilage, fewer accidents, and improved employee morale.

Headings of the bulletin's various sections are: "Here's What Is Happening to Industrial Lighting," "New Era in Lighting Fixtures," "Comfortable Working Environments Pay Off," "Another Look at the New Look," "The Revolution Applies to All Plant Areas," and "The Role of G-E. Lamp Research."

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pening to Industrial Lighting," "New Era in Lighting Fixtures," "Comfortable Working Environments Pay Off," "Another Look at the New Look," "The Revolution Applies to All Plant Areas," and "The Role of G-E. Lamp Research."

Complete Line of Tumbling Barrels

Tumb-L-Matic, Inc., Dept. MF, 4510 Bullard Ave., New York 70, N. Y.

Bulletin LS-52 gives full information on barrel sizes, drives, controls, and liners for the LS line of dry process barrels for cutting down, deburring, definning, dry burnishing, and polishing metal and plastic parts.

A specification table gives standard model numbers, dimensions, and number of compartments per barrel. Also included are recommendations for specific abrasive compounds for various tumbling operations.

For similar information on wet tumbling Bulletin XL-52 is available.

Practical Applications of Metallizing

Metallizing Engineering Co., Inc., Dept. MF, 38-14 30th St., Long Island City 1, N. Y.

This general bulletin on metallizing covers a wide range of practical applications of the process in machine element maintenance and repair, production, production salvage and corrosion prevention. The 8-page, illustrated bulletin, 51A, discusses the characteristics of sprayed metal, de-

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ZINC with Luster-on[®] IS SUPERIOR TO CADMIUM for most industrial applications

Preconceived notions that cadmium plating just naturally offers better protection than zinc are contrary to the true facts. Simply because cadmium is freer again is no reason for re-converting to it. Cadmium is still and always will be far more costly than zinc. When the zinc is passivated in Luster-on conversion treatment it is far superior to cadmium for all but extremely specific applications. These are basically (1) a marine atmosphere and (2) a bearing surface.

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BUT IF YOU MUST USE CADMIUM to meet specifications, the new LUSTER-ON Cd, specially developed to use on Cadmium plate, will give you a BETTER, BRIGHTER CADMIUM.

Write for free data sheets on
Luster-on Treatments

THE Chemical CORPORATION
38 Waltham Ave., Springfield 9, Mass.

scribes in general where metallizing is used, its general advantages and limitations.

The bulletin describes the use of metallizing in corrosion protection on structures and equipment, such as tanks, gas holders and capacitor cases. The equipment required for metallizing is described and a typical installation is illustrated.

Data Sheet on B.T.U. Meter

Minneapolis - Honeywell Regulator Co., Brown Instruments Div., Dept. MF, Station 64, Wayne & Windrim Aves., Philadelphia 44, Pa.

Instrumentation data sheet No. 10-191 describes the operation and application of the Brown B.T.U. meter which simultaneously records differential temperature and flow of a liquid and provides direct B.T.U. reading.

The equipment is applicable to heat exchanger testing, measurement of heat transfer, and recording of thermal data of processes in pilot plants, as well as to many other industrial uses.

Flexible Metal Hose

The American Brass Co., American Metal Hose Branch, Dept. MF, Waterbury 20, Conn.

Publication of a 16-page, illustrated "Quick Reference" catalog, describing American Flexible Metal Hose and Tubing, is announced by the manufacturers, *The American Brass Company*. These products are made in two basic types: seamless and strip wound. Cata-

log shows wide range of available alloys and sizes, suggested applications, and furnishes data on hose and fittings. Engineering information is also included.

Available free of charge. Ask for Catalog CC-400.

Wagner Price-Tips

Wagner Brothers, Inc., Dept. MF, 418 Midland Ave., Detroit 3, Mich.

A new, interesting and informative six-page bulletin 8½ x 11 inches, printed in two colors is being issued every month by Wagner Brothers, Inc., manufacturers of plating supplies and equipment. The bulletin, "Wagner Price-Tips" contains price information on all plating and polishing supplies and standard equipment distributed by Wagner Brothers, and news of recent developments in the plating industry. The data is timely and of interest to all plating men.

Copies may be obtained by writing the above company.

Dry Lubricant Bulletin

Gilron Products Co., Dept. MF, 6007 Euclid Ave., Cleveland 3, O.

A new 8-page, 2-color folder has been issued by Gilron, describing a new dry lubricant for drawing, forming, and extruding. Methods of application are described, and information is given on special equipment for applying Drawcote.

A brief description of the company's other drawing compounds and metal cleaners is also included.

use

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SAVE TIME . . . SAVE LABOR . . . INCREASE PRODUCTION
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Removal of metal can be controlled down to .0002 of an inch.

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Speed Reduction Units

The American Pulley Co., Dept. MF, 4200 Wissahickon Ave., Philadelphia 29, Pa.

The new "Shaft-King" shaft-mounted speed-reduction units are illustrated and described in a 20 page speed reduction drive catalog just published. The catalog gives complete information or dimensions of units, where they are used and how they are installed, including instructions on how to select the correct size unit for a given application. Cutaway and phantom drawings illustrate details.

News from California

By Fred A. Herr



Arnold O. Beckman, president of Beckman Instruments, Inc., South Pasadena, Calif., has announced the appointment of Phillip del Valle as plant manager of the firm's Synchro Division.



Phillip del Valle

Synchros are devices that transmit information from a central point to distant moving parts for action. Applications include remote control of anti-aircraft firing, stabilizing systems in ocean vessels, guided missile control and automatic pilot operation.

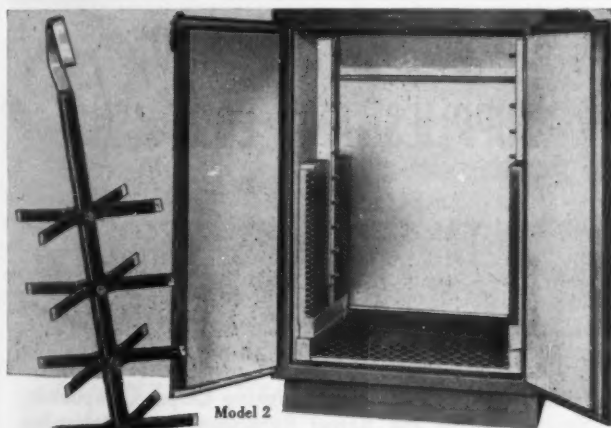
Del Valle was formerly project engineer in synchro manufacturing with Doelcam Corporation, Newton, Mass., and also served as a design engineer with Ford Instrument Company, Long Island City, N. Y. A graduate in elec-

trical engineering from Pratt Institute, New York, he has been with the Beckman company since 1951.

Kelite Products, Inc., Los Angeles, has announced the promotion of Burton Waters from Southern California service engineer to regional sales manager in that area. Burton has served in a sales and service capacity for Kelite for the past five years.

Nick Palasotti, 42, owner of Culver Plating Co., 515 South Hewitt St., Los Angeles died of a heart attack December 23. Palasotti spent 15 years in the plating department of Pacific Enameling & Plating Co., and thereafter served several years with Southern California Plating Co., both in Los Angeles, prior to purchasing Culver Plating Co. in the mid-Forties. He operated it as a job shop, working mainly on bumpers and other auto parts. The widow, Mrs. Grace Palasotti, who has taken an active part in plant operations during the past few years, is carrying on the business.

Visitors to Los Angeles in January included the following: Dr. Allan



Model 2

Automatic Oven Cures Rack Coatings Better

Automatically maintains correct preheating and curing temperatures for proper coating of plating racks. Holds any temperature for which set (between 300 and 450°F.). Layout of efficient Rack Coating Department and complete information on BELKE Electric Ovens in Bulletin 1061. Ask your BELKE Service Engineer, or write.

Inside dimen.	MODEL		
	1	2	3
WIDE	24"	36"	48"
HIGH	48"	48"	48"
DEEP	24"	24"	24"

Other sizes to specifications

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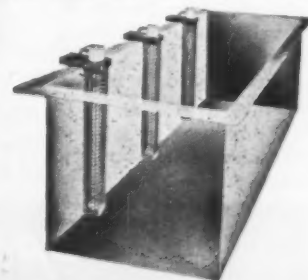
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Here's the immersion heater that overcomes all the problems you've ever had with heating corrosive solutions. Readily adapted to thermostatic control. Light weight, portable, fused quartz body is totally inert to all plating, pickling and electro polishing solutions. Vapor proof electrical connection box. Rugged construction. Long, trouble-free service. Remarkably economical. We will help you engineer special applications.

Write for Bulletin G-13



CLEVELAND PROCESS COMPANY
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Chester, vice-president, *Promat Division, Poor & Company*, Waukegan, Ill.; and *Anthony J. Freystack* of *Poor & Company*—on a business trip for conferences and discussions with western distributors for *Probrit* finishes.

James H. Conolly of the electrodeposition division, *Graham, Crowley & Associates*, Chicago, research and development engineers in the chemical, electrochemical and industrial fields.

Salvador Toledo of Los Angeles is well on his way to catching up to or surpassing the industry longevity records of some of the veterans of Southern California plating circles. Toledo resigned recently as chief of special finishes for *Pacific Enameling & Plating Co.*, Los Angeles, with which firm he had served 28 years, starting as sweep-up boy at the age of 19 in 1924. He recently switched to *Southern California Plating Co.* as shop foreman and supervisor of special finishes. Toledo, who is only 47, hopes to round out another 28-year cycle with Southern Cal. Plating, and knock into a cocked hat the records of *Don Bedwell* (47 years in plating),

John Merigold (52 years) and other competitors for long-distance service honors.

Solar Aircraft Company, San Diego, Calif., has named *E. Dale Harman* as assistant manager of the quality control division. Mr. Harman has been with Solar 18 years, most recently as a field service engineer.

Aluminum Import Corporation, United States distributor for *Aluminum Company of Canada, Ltd.*, has opened sales offices at 510 West Sixth St., Los Angeles, Calif., with *Ray A. Gentels* of Toronto, Can., in charge.

Charles A. Baker, who formerly served as district manager at Milwaukee, Wis., for *Chase Brass & Copper Co.*, has been appointed western regional manager, with headquarters in Los Angeles, and supervision over Chase sales activities in the eleven western states.

Oliver United Filters, Inc., San Francisco, has appointed *Dwight Richards* to the post of director of engineering.

Richard Coen, formerly of the chemical department staff of the *L. H. Butcher Company's* San Francisco division, has been appointed manager of the firm's San Francisco metal finishing department, under the direction of *Jack Raskin* of Los Angeles, plating supervisor of the company's entire western division.

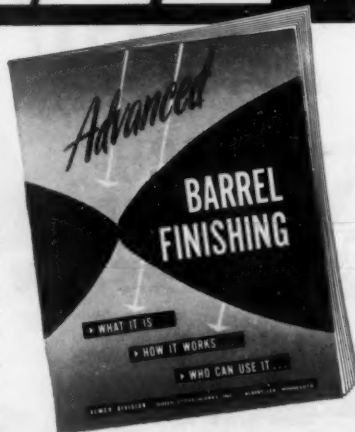
Homer F. Potter who for the past two years has served as director of the northern California district of the *Office of Price Stabilization*, has been appointed regional director of the *Small Defense Plants Administration* with jurisdiction over California, Arizona and Nevada. His headquarters are in San Francisco. *Joseph V. Ragusa* has been named head of the Los Angeles Branch office at 117 West 9th St.

Applied Research Laboratories, Glendale, Calif., has announced plans for establishment of a branch factory in Lausanne, Switzerland, to provide more convenient and economical distribution of spectrochemical equipment to European manufacturers. *Dr. M. F. Hasler*, president of *Applied Re-*

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CLEANRITE METAL CLEANERS
Metal Cleaners for all purposes.

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search, who has been in Europe supervising construction and installation, advised the Glendale headquarters recently that the new plant was expected to be ready for operation early in 1953. The plant is to be of 3,000 sq. ft. capacity and will be staffed by some 15 technicians from California.

The Powdered Metal Division of Kwikset Locks, Inc., Anaheim, Calif. announces that a new 16 mm. educational color film entitled "Precision Parts from Powdered Metal" is now available for showing to technical societies and other interested groups, free of charge. The film presents detailed descriptions of the powdered metal manufacturing process from the design of a lock plug for Kwikset locks to completed parts. Also shown are copper impregnation, porosity of an oil retaining cam, and various other parts that can be made from powdered metals.

Monsanto Chemical Company has announced appointment of W. W. Hayes of San Francisco as its Northwest district sales representative. G. A. Nethercut and W. F. Burnett have

been appointed, respectively, as sales engineers in Seattle, Wash., and Portland, Ore.

Shop and offices of the Aqua Honing & Metal Finishing Co. at 1100 Hilcrest Blvd., Los Angeles, were gutted by fire recently with damage estimated at \$30,000. A helicopter pilot flying mail between downtown Los Angeles and Los Angeles International Airport spotted the fire and notified the fire department by radio.

Inet, Inc., Los Angeles, has announced appointment of Myron M. Hemmerdinger as supervisor of material, a newly created post which invests him with direction over purchases of components for selenium rectifiers and other control and power equipment produced by the firm. Hemmerdinger formerly served as purchasing manager for Drayer-Hanson Corp., Los Angeles. Inet rectifiers are distributed nationally by Crown Chemical and Engineering Co., of Los Angeles.

Eay State Abrasive Products has appointed Robert E. McDonald and E.

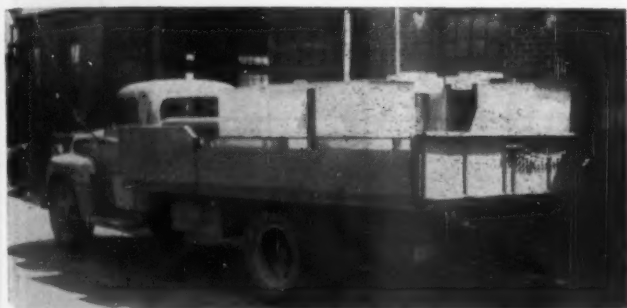
B. Jones, Jr., as West Coast representatives — McDonald as northern California representative, with offices in Republic Supply Company's San Leandro headquarters, and Jones in Southern California, with headquarters in Los Angeles.

TECHNICAL LITERATURE

Surface Preparation Specifications

Steel Structures Painting Council, Dept. MF, 4400 Fifth Ave., Pittsburgh 13, Pa.

The Steel Structures Painting Council has just issued a series of nine Surface Preparation Specifications which include the following: No. 1 Solvent Cleaning, No. 2 Hand Cleaning, No. 3 Power Tool Cleaning, No. 4 Flame Cleaning of New Steel, No. 5 Blast Cleaning to "White" Metal, No. 6 Commercial Blast Cleaning, No. 7 Brush-Off Blast Cleaning, No. 8 Pickling, and No. 9 Weathering and Cleaning. The entire series can be obtained for \$1.00 from the Secretary at the above address.



Loads of tank satisfaction

THE STORTS tank welding specification makes sure of stout, tough welds; it leaves no reduced sections, no unwelded areas on shell seams. Sound, solid, full section, full strength welds are used to extract the maximum utility from the plate material. Storts takes a closer look at your real needs, aims not only to fill your order but also to win your satisfaction.



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FILTER 50-1500 GAL/HR ANY ELECTROPLATING SOLUTION

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Model LSI-10
Cap. 100 gal/hr
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Filter Assembly
Portable, Wt. 40 lb.
12"x 16"x 16"



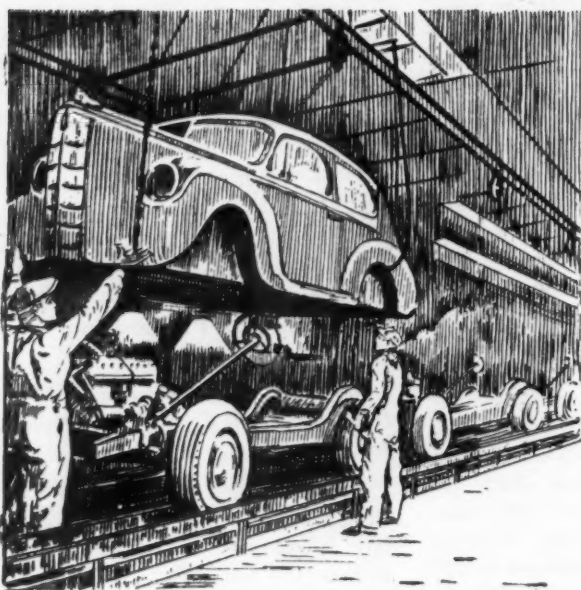
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Saves time and money by reducing rejects
No loss of precious solutions
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Corrosion-proof #316 stainless steel construction
H.T. Lucite, #316 stainless, rubber-lined, or Sethrin*
Resin filter assemblies

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MOTOR CITY PLATING NEWS



by

Edward Finne

Park Chemical Co. of Detroit has obtained new manufacturing and warehousing facilities in Philadelphia in order to better handle sales and production of their heat treating and chemical materials.

T. J. Clark, general manager of the

Park's eastern division, will head the operation and will be assisted by C. H. Eisler as plant manager.

Detrex Corp. announced the election of A. O. Thalacker as president and Robert A. Emmett, Sr., as board

chairman at the company's thirty-third anniversary dinner Friday night, January 9th, at the Statler Hotel.

Thalacker has been vice-president and general manager. Emmett, a founder of the company, had been president.



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Thalacker joined the Detroit industrial cleaning and chemical manufacturing concern in 1937. He is also a director and first vice-president of *Hooker-Detrex, Inc.* which has plants in Ashtabula, Ohio and Tacoma, Washington.

A new plating plant has begun operations in the Detroit area. The *J. E. Fitzgerald Company* at 2145 Eight Mile East has opened its doors for production rust-proofing and will specialize in cadmium and zinc plating of small automotive screw machine products and metal stampings. Facilities in the 5,000 square foot plant will also include dichromating, phosphate coating and black oxidizing.

The officers of the new company are *James Fitzgerald*, president; *Harold Lightbody*, vice-president and *John Reilly*, Secretary-Treasurer. *George Gendron* will supervise all plant operations.

Jim Fitzgerald was formerly a *Udylite* sales representative for the Detroit area.

William R. Shields Co. formerly located in the Detroit General Motors Building has moved the company's offices to their plant and warehouse at

1347 Wordsworth Ave., Ferndale (Detroit 20) Mich.

Industrial Lubricants Co., Inc., long established Detroit maker of polishing cement, drawing compounds, cleaners and rust preventatives, has appointed *W. C. Kennedy* as general sales manager and *Hubert E. Evans* as chief chemist.

Kennedy has had 20 years of executive experience in the automotive, material handling, aircraft and industrial chemical and lubrication industries and *Evans* more than 25 years in research and development, engineering and sales and customer service.

Chester Borlet is the new manager of sales for the Detroit office of *The McGean Chemical Co.* replacing *William Hopkins* who has moved East in a new position.

Chet has just returned from a sales position for *United Chromium* in Los Angeles where he had spent a few years. Previously he had operated the plating plant of *Glendale Products* in Detroit after several years in technical sales for the *Harshaw Chemical Co.*

The Detroit office of the *McGean Chemical Company* has been moved

to 18975 James Couzens Highway from its previous location in the Bohl Bldg.

The January meeting of the *Detroit Branch of the American Electroplaters' Society* was held on Friday, Jan. 9th at the Statler Hotel.

This meeting was a joint meeting with the Detroit section of the *Electrochemical Society* and presented *Dr. Abner Brenner*, chief of the Electrodeposition Section of the National Bureau of Standards, as the principal speaker.

Dr. Brenner spoke on the electro-deposition of some of the less common metals from non-aqueous solutions.

In addition to the talk, the second part of *International Nickel Company's* color film *Corrosion in Action* was shown.

Refreshments were served at the completion of the meeting.

Wyandotte Announces Election of George H. Baker

Election of *George H. Baker* as vice-president in charge of the employee and public relations department of *Wyandotte Chemicals Corp.*, was announced by *Robert B. Semple*, president.

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Baker joined the nation-wide chemical company in September, 1950, as director of employee and public relations following broad experience in the field of human relations in both industry and government.

A native Coloradan and graduate of Leland Stanford, Jr. University, Baker was called to duty as an army reserve captain in July, 1940 and assigned to the joint Army-Navy Selective Service Committee to work on the organization of a Selective Service System. Just prior to the outbreak of hostilities, he was made Chief of the Manpower Division of the Selective Service System with responsibility for registration, classification and induction. For this service, he was awarded the distinguished service medal. At the end of the War, he was a colonel in charge of the division handling manpower problems as they affected industry, and principal assistant to Major General Lewis B. Hershey, director of Selective Service. He still holds a colonelcy in the army reserve.

In 1945, Mr. Baker went to the Philippines as assistant financial adviser to the high commissioner.

He subsequently entered the person-



George H. Baker

nel field in industry spending eighteen months with the Rexall Company and approximately three years with the American Potash and Chemical Corp., both West Coast concerns. He left American Potash to join Wyandotte Chemical Corporation. He is now a resident of Grosse Ile, Mich.

Michigan Chrome Announces Transfers and Appointment

James Gonyeau has been transferred



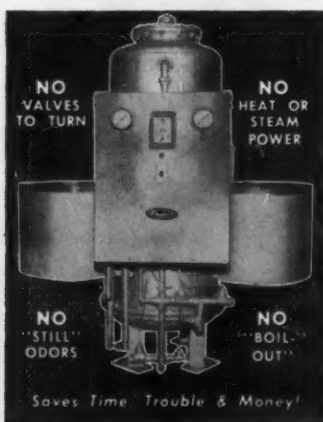
James Gonyeau

by Michigan Chrome & Chemical Co., Chemical Division, to the Chicago area as sales representative.

Mr. Gonyeau received his B.S. Degree in Physics from Wayne University, Detroit, after completing several years' service in the Army during World War II. He represented Michigan Chrome in Michigan for two years prior to assuming duties in the Chicago territory, succeeding King Ruhly,

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easy to control . . . cuts down on trouble that entails costly delays.

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Reduce Rejects

gives unbelievable uniformity of deposit in recesses . . . brighter, white color.

Write for **FREE** bulletin revealing tricks on improving your nickel plating and cutting costs.

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Bob Richards



Don Patterson

who was promoted to sales manager. He is living in Park Forest, Ill. and is responsible for directing sales of plating rack coatings, stop-off materials and corrosion resistant coatings for the company in the mid-western area.

Bob Richards has been transferred to the Eastern territory as sales representative for the Chemical Division. He replaces Frank Jones who was promoted to assistant sales manager.

Mr. Richards spent a number of years in the Army Air Corps, and attended Montana State College and Michigan State Normal. He was with Pittsburgh Plate Glass Co. as sales representative prior to coming with Michigan Chrome, where he received experience in the sale of the firm's rack coatings in Michigan.

Don Patterson has been appointed new sales representative for Michigan. He attended Wayne University, De-

troit, after his discharge from the Army, where he served during World War II. He will be responsible for sales of plating rack coatings, stop-off materials and corrosion resistant coatings for the electroplating industry, as well as vinyl plastisol applications.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY



New York Branch

The meeting was called to order by A. Amatore, President, on Friday, December 12, 1952, at the Hotel Statler, New York. The minutes of the previous meeting were read, and approved. The roll of officers was called and P. Voit and M. Maher, Jr., were noted absent.

The following were elected to membership, and duly installed: J. Kushner, R. Wasilenski, J. Krobek, Mrs. T. Y. Susskind.

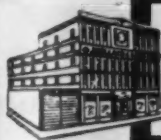
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There being no other old or new business, the meeting was turned over to M. Nadel, Librarian, who in turn presented J. B. Winters, Technical Director of the R. O. Hull & Co., Inc. Mr. Winters included the presentation of colored slides with his talk, showing the practical control of plating baths with the Hull cell, which was most interesting.

Pittsburgh Branch

The Pittsburgh Branch held its monthly meeting at the Sheraton Hotel on December 11. The officers and committee chairmen presented reports on their various projects. The Milwaukee Night party was reported as a very successful social event and all who were able to attend felt that it was an evening well spent.

Bill Wilson, the Annual Banquet chairman, informed the members that plans for the banquet are progressing very nicely and that the banquet will be held at the Sheraton Hotel on May 2. This change in date was decided upon to avoid holding the banquet on the same night as the Cleveland Branch.

Twenty members enjoyed a good

dinner prior to the business meeting at which approximately forty members and guests were present. We were very happy to receive two new applications for membership in our Branch. They are Harry A. Early and Henry J. Schaltenbrand both of the Pittsburgh Commercial Heat Treating Co.

The Librarian introduced the speaker for the evening, Mr. F. H. Kahler of Illinois Water Treatment Co., Rockford, Ill. The subject which Mr. Kahler so ably discussed was "Use of Ion-Exchangers in the Plating Industry." Ion-exchangers are being used more and more in the metal finishing industry and it is quite apparent that in years to come, they will become accepted pieces of equipment in regular plating lines. Solution control is far more stable with the use of ion-exchangers and also, when used in rinse waters, the potential advantages can save the plating industry a terrific amount of money and eliminate stain trouble.

An interesting question period followed Mr. Kahler's main presentation and we were all very happy to give the speaker a rising hand of applause

for a most educational and pertinent lecture.

Refreshments were enjoyed by all in our regular social gathering after the main meeting.

Cincinnati Branch

The Cincinnati Branch ended their activities for the year with its meeting on December 17th at the Engineering Society Headquarters. Those who turned out for the dinner prior to the meeting were rewarded with an unusually tasty meal featured with a succulent filet mignon. Once the supper had been attended to, President Robert D. Miller called the meeting to order, reporting himself on the annual meeting of the Technical Society which will be held in the spring with a place and speaker not as yet determined. A per capita tax of \$0.15 will be levied on each member to pay for this event.

The Secretary then announced the transfer to the branch from Buffalo of A. R. Waters of the Harshaw Chemical Company. The student application of Ronald L. Griffith of Electric Auto-Lite was presented and accepted to membership. The members were asked to answer the questionnaire which had been sent out by the national office.



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PRODUCTS

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Charles Wise reported on the progress of the Educational Meeting & Dinner Dance to be held on March 28, 1953. He stated that tickets should be available next month and that letters announcing the event would also be sent out shortly. Ray Barry asked for suggestions on speakers, and it was felt that a panel on Waste Disposal and a talk by Ezra Blount on Electroplating Procedures in Japan would offer a well-rounded program.

Mr. Miller paid tribute to Martin M. Gannon, Jr., a most active and interested member of our Branch, who passed away suddenly on October 20, 1952, one day after the last meeting. Marty was a quiet, unassuming chap who could always be counted on to do his part in any Branch activity. His absence will be keenly felt.

Stewart Chipman suggested discussion of a picnic next summer which was resolved with the appointment of a committee headed by Bill Young as Chairman aided by Bill Gordon and Dick Evans.

Dr. R. A. Schaefer, Director of Research, Cleveland Graphite Bronze Co. and 2nd Vice-President of the A.E.S.

was presented as the speaker. Dr. Schaefer took "Selected Cathode Shapes and their Effect on Metal Distribution" as his subject, illustrating his entire talk with slides. He also discussed various Society problems pointing the extreme difficulty in obtaining a sufficient quantity of able technical papers. He also mentioned the Executive Meeting in Columbus on January 10, 1953, asking for a representative turnout from Cincinnati which was promised him.

The meeting adjourned at 9:35 P.M. with MacDermid, Inc. acting as hosts for the usual Social Hour.

Charles Wise, Branch Secretary

Chicago Branch

The Chicago Electroplaters' Institute, an organization of job shop owners, were the guests of the A.E.S. Chicago branch for their December 12 meeting.

A total attendance of 108 members and guests enjoyed an excellent dinner, the educational program and refreshments before curfew sounded. Ken Chamberlain, vice-president of H. N. Hartwell & Son, Boston, Mass.,

delivered an exciting description of the uses of rigid polyvinyl materials for plating room applications. Mr. Chamberlain ended his program with an impressive demonstration of legerdemain which completely mystified all in attendance.

Ewell McCoy's Research Finance Committee turned in a glowing report of accomplishment with their announcement of the signing of four new companies as sustaining members. Arnold, Schwinn Co., Platers Technical Service, Atlas Plating Co. and the Metal Craft Corp., all of Chicago are the latest additions to our sustaining membership honor roll. We understand that Charlie Geldzahler deserves an accolade for some fine work as a member of chairman McCoy's committee.

Starting with the January meeting, Chicago branch business meetings will be conducted on the second Friday of each month promptly at 6 P.M. and immediately preceding the regular educational meeting and dinner which is held on the same date. This change in meeting date was the result of a membership poll conducted by secre-

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Great Lakes Plating Co. attended in force with **Gus Paulis**, **Bob Bonaguidi** and **Hank Peters** — **Jack Dorf** of Master Finishers shaking hands with the right one — **Hal Younger** fully recovered from his bout with pneumonia — **Ralph and Bruce Belke** doing their part for the society — **Bill Jeffries** got out of court long enough to favor his favorite society with his presence — **Art Murphy** on the scene once more — **Dick Scharff** of Ionia, Mich., assisting **Ken Chamberlain** — **Allen Brumm** of Kuehne Mfg., Mattoon, Ill., declaiming on the use of black wrought iron for furniture — **Charlie Baldion** of Triplex Plating, Michigan City, Ind. — **Bob Sizelove** of Frederick Gumm Chemical Corp. representing the Newark branch — **Jack Curry**, **Frank Martin** and **Bill Strelow** making their Hot-points — **Al Klomp** and **Oliver Smith** of Sunbeam seen with **Jim Vallone** — The **Kocour** brothers, **Orv** and **Les**, out on passes — **Berteau-Lowell Plating Works** represented by **Joe Mel-**

nitzke and **Erwin Elies** — **Glen Neely** and **Gus Brown** of the Richardson Co. learning about R.P.V.

Boston Branch

The Boston Branch of the *American Electroplaters' Society* will hold its annual Educational Session and Banquet April 18, 1953 at the Hotel Statler.

Speakers: **Clifford Struyk**, General Chemical Div. Allied Chem. & Dye Corp. N. Y. C.; **Dr. Walter R. Meyer**, Enthone Co., New Haven, Conn.; **H. C. Irvin**, Allied Research Products, Baltimore, Md.

Committee: Hotel Reservations — **Walter Larssen**, Wyandotte Chemical; Finance — **Louis J. Love**, M. E. Baker Co.; Program & Publicity — **Arthur W. Collins**, M. E. Baker Co.; Ladies — **Ann Baker Love**, M. E. Baker Co.; Banquet Seating — **Howard Wardell**, Glover Coating Co.; Registration — **R. Helgeson**, Sparkler Mfg. Co.; Ticket Receipts & Reservations — **George P. Swift**, Cons.; Ticket Records & Mailing — **James H. Anderson**, Reece Corp.; Entertainment — **Harold Narcus**, Electrochemical Industries; Education — **Elaton A. Flores**, Sylvania Electric Products; Speculative Assist-

ant — **Manson Glover**, Glover Coating Co.; General Chairman — **Myer Shapiro**, Gillette Safety Razor.

Educational Session — 2:00 P.M. Bay State Room.

Banquet — 7:00 P.M. Grand Ball Room.

Floor Show — 9:00 P.M.

Dancing — 10:00 P.M.

No head table with long winged speakers at the banquet.

George M. Swift, Secretary

Indianapolis Branch

On Wednesday night, January 7, 1953 the Indianapolis Branch held its regular monthly meeting at the Fox Steak House. Due to the very inclement weather the attendance was limited and our Secretary wisely decided not to make the 120 mile round trip from Lafayette to attend the meeting. In her absence **Don Patrick**, President, asked **Herb Kennedy** to act as Secretary. There were 16 members and guests present for dinner at 6:30 and three more joined the group for the meeting which began at 8:00.

Since the speaker of the evening had another engagement it was decided that his portion of the program would

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be given first. Our speaker was *Leo Baldwin* of the Indianapolis Hospital Development Association, who was introduced by *Bert Hawhee*, Program Chairman. Mr. Baldwin showed an excellent movie entitled "You're The Doctor" which outlined the many services and advantages of the various local hospitals throughout the country. Following the movie Mr. Baldwin described the campaign which is being conducted by the Indianapolis Hospital Development Association on behalf of building additions to the private hospitals in Indianapolis.

Following the talk the business meeting started at 9:05 P.M. The minutes of the last meeting were approved as read. *Don Patrick*, President advised that *Arthur L. Chesterfield*, a member and former president of the Indianapolis Branch, died on Dec. 8. A number of members attended the funeral. The Branch sent flowers and a letter of condolence.

Dr. A. M. Max, one of the delegates to the last convention, has been appointed the Branch representative to the January 10 Interim meeting in Columbus, O.

As far as we know there has been no announcement made as yet regard-

ing the proposed January meeting of the Stream Pollution Board. As soon as a date is known, the Secretary will advise the various members by letter.

Los Angeles Branch

The impression made by *Dr. Hubert M. Goldman* of *Enthone, Inc.*, New Haven, Conn., on the speaker's program of the 1951 annual educational session of Los Angeles Branch, *American Electroplaters' Society*, was so favorable that his name was promptly check-marked by *Myron H. Orbaugh*, the 1951 general educational chairman, for a return engagement at the first available opportunity.

That opportunity did not present itself again till January of this year. When Orbaugh, now president of the branch, heard that Dr. Goldman was to be in California early in the year he set the wheels in motion to have the Enthone executive address the branch again. Arrangements for his appearance were made by *Earl W. Arnold* of the *L. H. Butcher Co.* (West Coast Enthone products producers), and Librarian *Stuart Krentel*.

At the January 14 meeting in Rodger Young Hall, Dr. Goldman followed up his 1951 talk on "Chemical

Conversion Coatings and Oxide Finishes" with an interest-holding discussion on "Adhesion of Electrodeposits and New Methods of Cleaning and Oxide Removal."

Before launching into his technical talk on new techniques in metal finishes, Dr. Goldman conveyed the greetings of members of *Bridgeport, Conn.*, branch of the A.E.S., of which he is a past-president.

In the opening phase of his discussion, Dr. Goldman stressed the importance of effective cleaning of the base metal to be plated. He cited the three major types of metal surfaces as (1) the wholly crystalline surface; (2) partly crystalline or amorphous; and (3), the completely amorphous, or non-crystalline surface.

His talk, in the main, dealt with the following subject matter: How mechanical treatment of the metal surface may effect the free energy in the metal; how, from the plating standpoint, careless machining of the base metal will cause headaches for the plater; and how the presence of smut left over from rolling and/or pickling operations becomes a major cause of faulty deposition.

The speaker also discussed clean-

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Wilfred S. McKeon,
Pres.

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ing and buffing techniques. He presented a picture of what happens in a buffing operation; Grit polishing, he said, will cause flow layers, while compounds may cause some flow layers but will not result in the compacting that comes from grit polishing.

At the conclusion of his formal talk, Dr. Goldman gave a demonstration of rust and scale removing techniques, using a portable testing setup which was mounted beside the speaker's table.

Highlight of the business session was the initiation of five new members by President Orbaugh: These were Stanley Kritzer, Marshall Hovde, Alexander McWhorman, Ray McDonald and George Duncan.

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Orbaugh also announced that approval had been voted on the request of transfers of two memberships from Chicago to Los Angeles Branch. The transferees are William B. Johnson of the Industrial Filter and Pump Co.; and H. R. Smallman, assistant to the vice-president, Hanson-Van Winkle-Munning Co., who has settled in Los Angeles as California supervisor of H.V.W.-M. affairs.

Secretary Krental and General Chairman George Hetz reported a full program of speakers for the annual educational session at Hotel Statler on March 21 has been arranged. Hetz, who also serves the branch as sergeant-at-arms, introduced the following guests: James Mead, Avalon Plating Co.; Jerry Henshaw, North American Aviation, Inc.; Rodney Jones, Turco Products, Inc.; Barker Woodward, Tool & Jig Plating Co.; William Stevens, William Stone and William Tiedeman, Progressive Plating Co.; James H. Conolly of Graham, Crowley & Associates, Inc., Chicago.

ELECTROCHEMICAL SOCIETY

Frederick W. Fink, corrosion technologist at Battelle Institute, Colum-

bus, Ohio, is the new chairman of the Corrosion Division of the Electrochemical Society.

Fink served as chairman of the American Association for the Advancement of Science's 1951 Gordon Corrosion Conference. He is the author of several papers on subjects in corrosion technology and is active in the work of the National Association of Corrosion Engineers and the American Institute of Mining and Metallurgical Engineers.

A graduate of Cornell University, Fink specialized in corrosion studies for his master's degree from Cambridge University (England). His World War II studies on problems of marine corrosion won for him the Naval Ordnance Award.

THANKS FOR YOUR CHRISTMAS CARDS!!

We acknowledge with sincere thanks the kind thoughts expressed in the Christmas cards received from the following:

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American Wheelabrator & Equip. Corp.
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